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UNITED STATES
DEPARTMENT OF THE INTERIOR
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BUREAU OF MINES
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INFORMATION CIRCULAR

MINING OF FELDSPAR AND ASSOCIATED MINERALS IN THE SOUTHERN BLACK HILLS OF SOUTH DAKOTA

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MINING OF FELDSPAR AND ASSOCIATED MINERALS IN THE SOUTHERN BLACK HILLS OF SOUTH DAKOTA[1]

By Jos. R. Guiteras[2]

CONTENTS

	Page
Introduction	6
Acknowledgments	6
Situation	7
Topography	7
Climate	7
Water supply	7
Power	9
Geology	9
General	9
Minerals of the Black Hills pegmatite	10
Historical review of pegmatite mining	10
History and development	10
Mica (muscovite)	10
Lithium minerals	11
Tin ore (cassiterite)	11
Rose quartz	11
Beryl	11
Columbite-tantalite	11
Tungsten	12
Andalusite and sillimanite	12
Pollucite	12
Feldspar	12
Production statistics	12
Small-scale marketing of pegmatite minerals	14
Mining laws applicable to pegmatite minerals	16
Prospecting permit	17
Special use permit	19

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2/ Mining engineer, metal mining methods section, Mining Division, Bureau of Mines.

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CONTENTS (Cont'd.)

	Page
Feldspar industry in the Black Hills	22
Keystone district	22
Consolidated Feldspar Corporation	22
Grinding mill at Keystone	22
Pegmatite mines in the Keystone district	24
Hugo mine	24
Dan Patch No. 3 lode	25
Confidence No. 1 lode	26
Dike lode	26
Watson mine	27
Edison dike	27
King Mica lode	27
Etta mine	28
Peerless mine	29
Ingersoll mine	29
Custer district	31
F. E. Schundler Feldspar Co., Inc.	32
Grinding mill at Custer	32
Mining activities	35
Local shippers	37
Smith mine	37
Roadside mine	39
Bull Elk mine	39
Phillip mine	40
Reed mine	40
Hot Shot lode	41
Beck lode	41
Tinsley mine	41
Lookout mine	42
Dakota Feldspar mine	42
Beryl lode	43
J. A. Johnson mine	44
High Land Spar lode	44
Mica King mine	45
Sylvanite lode	45
Come Along lode	45
Harball's mine	46
McKay No. 1 lode	46
Conlon mine	46
Wood mine	47
High Climb mine	47
Shamrock No. 1 lode	48
Triangle A lode	48
Tillison's mine	48
Number Nine lode	48
Red Rose No. 1 lode	49
Haselrodt lode	49
Bink lode	49

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CONTENTS (Cont'd.)

Page

Feldspar industry in the Black Hills (continued).
Custer district (continued).
Local shippers (continued).
Gira and Ainsley's dike..... 50
Wilhelm mine..... 50
Raver and Michaud mine..... 50
Heidepriem and Cattles' mine..... 51
Dilley's mine..... 52
Seller's mine..... 52
Mountain Rose mine..... 53
Soda Spar mine..... 53
Mayo lode..... 54
Virginia dike..... 54
Big Bull lode..... 54
Hidden Treasure lode..... 55
Ski-High lode..... 55
Rambler lode..... 55
Wayside lode..... 56
Sonny Boy lode..... 56
Roaring Lion lode..... 56
Louise lode..... 57
Maryland lode..... 58
Fannie McAdam ranch..... 58
Tip Top lode..... 58
One Point lode..... 59
Custer Mountain lode..... 59
Emma Hardesty homestead..... 60
Ross dike..... 60
Phelps dike..... 61
Lee Burrow's dike..... 61
H. & M. lode No. 5..... 61
New Deal lode..... 61
E. L. Davis mine..... 62
Lone Pine lode..... 62
Friday lode..... 63
Independence lode..... 63
Independence No. 1 lode..... 63
Pot lode..... 64
Tut lode..... 64
Little Spar lode..... 64
Bet lode..... 65
Cat lode..... 65
Corky lode..... 65
Old Mike mine..... 66
New York mica mine..... 66
Scott's Rose Quartz mine..... 66
Tin Mountain mine..... 67
Beecher lode..... 67
Big Tom mine..... 69

Generated on 2024-09-19 08:21 GMT / https://hdl.handle.net/2027/osu.32435030643969
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CONTENTS (Cont'd.)

Page

Feldspar industry in the Black Hills (continued)
Custer district (continued).
Abingdon Sanitary Manufacturing Co..... 69
White Elephant mine..... 69
Townsite lode..... 71
Virginia lode..... 71
Consolidated Feldspar Corporation prospects.... 71
Dorothy lode..... 71
Dorothy No. 1 lode..... 72
Helen lode..... 72
Helen No. 1 lode..... 72
Helen No. 2 lode..... 72
Helen No. 3 lode..... 73
Helen No. 4 lode..... 73
Helen No. 5 lode..... 73
Lucky Spar lode..... 73
Bald No. 1 lode..... 74
Bald No. 2 lode..... 74
Bald No. 3 lode..... 74
Bald No. 4 lode..... 74
Ridge lode..... 75
Moon lode..... 75
Lincoln lode..... 75
Lincoln No. 1 lode..... 75
Lincoln No. 2 lode..... 75
Lincoln No. 3 lode..... 76
Lincoln No. 4 lode..... 76
Lincoln No. 5 lode..... 76
Lincoln No. 6 lode..... 76
Lincoln No. 7 lode..... 77
White Mica lode..... 77
White Mica No. 1 lode..... 77
South lode..... 77
East lode..... 78
High lode..... 78
Top lode..... 78
West lode..... 78
Bare Top No. 1 lode..... 79
Bare Top No. 2 lode..... 79
Star lode..... 79
Sno lode..... 79
Sno No. 1 lode..... 80
Sno No. 2 lode..... 80
Bull Moose lode..... 80
Mitchell lode..... 80
Mitchell No. 1 lode..... 81
Mitchell No. 2 lode..... 81

Generated on 2024-09-19 08:17 GMT / https://hdl.handle.net/2027/osu.32435030643969
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CONTENTS (Cont'd.)

Page

Feldspar industry in the Black Hills (continued).
Custer district (continued).
Consolidated Feldspar Corporation
prospects (continued).
Harry lode..... 81
Rives lode..... 81
Red Deer lode..... 82
I. X. L. lode..... 82
I. X. L. No. 3 lode..... 82
I. X. L. No. 4 lode..... 82
I. X. L. fraction..... 83
Spud lode..... 83
Lost Spring lode..... 83
Ed lode..... 83
Roxy lode..... 84
Flynn lode..... 84
Sunset lode..... 84
Sunrise lode..... 84
Pine Top lode..... 84
Pine Top Fraction lode..... 85
Henwood lode..... 85
Albert Lee lode..... 85
Pick lode..... 86
E. M. lode..... 86
A. M. lode..... 86
Art lode..... 86
Big Horn lode..... 87
Red Spar lode..... 87
Forty-five lode..... 87
Saw lode..... 87
Poppy lode..... 88
Lookout lode..... 88
Red Poppy lode..... 88
Maxine lode..... 88
Mack lode..... 88
Red Bird lode..... 89
Short lode..... 89
O. K. lode..... 89
O. K. No. 2 lode..... 89
O. K. No. 4 lode..... 90
Bet lode..... 90
Conclusions..... 90
Bibliography..... 92

Generated on 2024-09-19 08:54 GMT / https://hdl.handle.net/2027/osu.32435030643969
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ILLUSTRATIONS

Fig.		Following page
1.	Pegmatite mines in Keystone district and prospects of Consolidated Feldspar Corporation in Custer district..	22
2.	Pegmatite mines in Custer district and other shippers to Custer mill.....	22
3.	Flow sheet of grinding mill, Consolidated Feldspar Corporation, Keystone, S. Dak.....	22
4.	Flow sheet of grinding mill, F. E. Schundler Feldspar Co., Inc., Custer, S. Dak.....	32

INTRODUCTION

This paper is one of a series published by the Bureau of Mines dealing with the mineral resources of western South Dakota. The mining of pegmatite minerals is described mainly from the standpoint of the feldspar industry, as most of the other pegmatite minerals produced are recovered as byproducts from the mining of feldspar. Feldspar is shipped from the Black Hills by three companies, all operating in the southern Hills. Because the pegmatites of the northern Hills, represented by the Tinton area, have been described in other papers3/ of this series, the present paper is confined to the pegmatite dikes of the southern Black Hills. Emphasis is placed upon the current activity in pegmatite mining; little attention is given to the history of many famous mines in the district, and information concerning the may be obtained by consulting reports cited in the bibliography. The field work was carried on from July 28 to October 15, 1938.

ACKNOWLEDGMENTS

The geology of the Black Hills has been studied almost continuously during the last half century. A wealth of literature has attempted to explain the geology and mineralogy of the pegmatite dikes of this region. The writer acknowledges his indebtedness to all earlier investigators, as well as to the following men, whose assistance in the field was of particular value: F. C. Lincoln, professor of mining, South Dakota School of Mines Mont Heumphreus, State mine inspector, South Dakota; Harold R. Eyrich, superintendent, and Bateman Eilbeck, mine foreman, F. E. Schundler Feldspar Co.; J. W. Mitchell, field man, Consolidated Feldspar Corporation; John Wells, mine operator and local mineral buyer, Custer, S. Dak.; Frank Hughes, general superintendent, and Harry Wasson, mine foreman, Hugo mine; D. W. Peterson, mine superintendent, Etta mine; Lon Walker, mine superintendent, Peerless

3/ Gardner, E. D., Tin Deposits of the Black Hills, S. Dak.: Bureau of Mines Inf. Circ. 7069, 1939, 78 pp.
Guiteras, J. R., Mining and Milling Methods and Costs at the Black Hills Tin Co.: Bureau of Mines Inf. Circ. 7084, 1939, 16 pp. (Deals with tantalite, amblygonite, and spodumene.)
Hess, Frank L., and Bryan, Barnabas, Jr., The Pegmatites at Tinton, S. Dak.: Bureau of Mines Rept. of Investigations 3404, 1938, 19 pp.

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ge; A. I. Johnson, engineer, Ingersoll mine; Dr. R. D. George, geologist, d E. Kautzsch, mining contractor, White Elephant mine.

SITUATION

The Black Hills uplift of South Dakota and Wyoming occupies an elliptical area roughly bisected by the South Dakota-Wyoming State boundary and tends in a southeasterly direction from the southern boundary of Montana most to the northern boundary of Nebraska. The greater portion of the ntral mountainous part lies in South Dakota and comprises both the northern lls, which extend south from Spearfish approximately to the Lawrence-mington County line, and the southern Hills, which extend south from ere to Hot Springs. The northern Hills include the pegmatite area at nton and the gold-mining camps at Lead, Deadwood, and vicinity. The southern Hills include the gold districts surrounding Keystone, Hill City, and ster, and the pegmatite areas that extend from Hill City and Keystone uth through Custer and Pringle almost to Wind Cave. The field work for e present paper covered the latter pegmatite areas.

TOPOGRAPHY

The topography of the southern Hills is generally mountainous and aracterized by scattered rocky ridges. The elevation of Hill City is 79 feet; Keystone, 4,342 feet; and Custer, 5,324 feet. The highest point the area is Harney Peak, 7,242 feet high, notable as the highest peak between the Rocky Mountains and the Atlantic Ocean.

CLIMATE[4/]

The United States Weather Bureau has recorded the precipitation at ster from 1911 to 1930. The nearest station at which temperatures and owfall have been recorded is Hermosa, about 20 miles east of Custer, at elevation of 3,302 feet. Climatic data at these stations are set forth table 1.

WATER SUPPLY

The southern Black Hills are drained by Spring Creek, Battle Creek, and ench Creek, which, with their tributaries, traverse the Hills in a general asterly direction and empty into the Cheyenne River. These streams are fed ainly by springs, which abound in the mountainous sections of the Hills. considerable amount of water is lost through seepage as the streams cross e sediments of the foothills and plains. Most of the surface water resulting from rain and melting snow runs off rapidly, but it appears likely hat steps may be taken soon to impound such water for irrigation and possibly for power. Fall River near Hot Springs and several streams in the orthern Hills are used for generating power.

4/ Weather Bureau, Climatic Summary of the United States: 1933.

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TABLE 1.- Climatic data at Custer and Hermosa, South Dakota.

	Jan.	Feb.	March	April	May	June	July	August	Sept.	Oct.	Nov.	Dec.	Annual
Precipitation (inches) at Custer, 1911-30:													
Average.....	0.49	0.49	0.78	1.86	2.89	2.87	3.65	2.48	1.52	1.22	0.54	0.36	19.15
Highest.....	1.25	1.87	2.20	8.45	5.94	5.14	7.84	5.37	3.35	3.68	2.37	1.30	27.91
Lowest.....	.00	T	.04	.10	.49	1.04	.42	.65	.06	.05	.00	.00	9.27
Temperature (°F.) at Hermosa, 1904-30:													
Average.....	22.1	25.5	32.9	44.9	53.8	63.9	71.1	69.3	59.9	48.2	35.5	25.2	46.0
Av. maximum.....	35.4	38.6	46.0	58.2	66.5	77.1	85.2	84.0	75.1	63.0	48.9	38.0	59.7
Av. minimum.....	8.9	12.4	19.7	31.5	41.0	50.8	56.9	54.6	44.7	33.4	22.2	12.4	32.4
Highest.....	72	75	87	92	97	103	106	106	104	96	78	73	106
Lowest.....	-37	-44	-22	4	16	30	37	32	13	-16	-14	-26	-44
Snowfall (inches) at hermosa, 1904-30:													
Average.....	4.7	2.9	2.6	3.9	0.3	0.0	0.0	0.0	0.2	1.5	3.5	4.5	24.1

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POWER

Electric power for mining and milling purposes in the Black Hills is pplied mainly by the Dakota Power Co., a subsidiary of the General Public ility Co. at Deadwood. Power for Hot Springs, at the southern end of the ack Hills, is supplied by the Southwestern Power Co. whose field covers e eastern part of South Dakota.

Generating plants of the Dakota Power Co. and the Homestake plant are terconnected. They include the following plants:

1. Custer plant, containing four 100-kv.-a. Diesel engines.
2. Big Bend hydroelectric plant, 12 miles up Rapid Creek from Rapid ty, containing three 500-kw. generators.
3. Rapid City plant, containing one 1,200-horsepower and one 1,400-rsepower Diesel engine and one 1,500-horsepower natural-gas engine. The tural gas is piped from Montana.
4. Pluma steam plant, containing one 3,000-kw. and one 2,000-kw. gen-ator.
5. Redwater hydroelectric plant near Belle Fourche, containing two 0-kw. generators.
6. A hydroelectric plant near the Redwater plant, containing one 300-. generator.

The rate schedule of the Custer plant for mining and milling operations llows:

	Cents per kw.-hr.
First 5,000 kw.	2-1/2
Next 15,000 kw.	2
Next 100,000 kw.	1-1/2
Over 100,000 kw.	1-1/4

The minimum charge is $1 per horsepower per month. The demand charge s $1.50 per kilowatt for 15 minutes demand during the 4 hours of peak load sually in the evening). If the power factor is increased by capacitors 90 percent, a 5-percent reduction is allowed on the power bill, and percent additional reduction is allowed for each percent above 90.

GEOLOGY

General

According to Darton and Paige,5/ the oldest rocks in the Black Hills e Algonkian slates, schists, and quartzites, all thought to have been pro-ced by the metamorphism of sedimentary beds during a period of intense lding that was followed closely by the intrusion of granite and pegmatite. nconformably upon these rocks were deposited the Cambrian sediments, followed

5/ Darton, N. H., and Paige, Sidney, Geol. Survey Geol. Atlas, Central Black Hills Folio (No. 219), 1925.

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by those of later date. The schists surrounding the circular mass of granite some 10 miles in diameter, which is exposed between Keystone and Custer, are cut by a great many pegmatite masses and dikes. The dikes range in thickness from a few inches to several hundred feet, and some of them are several miles in length. Where the dikes invaded the schistose Algonkian rocks they followed the structural planes to some extent; therefore, their strike is roughly tangential to the main granite intrusion.

Minerals of the Black Hills Pegmatite

The Black Hills pegmatite is a granite pegmatite, the essential minerals of which are potash feldspar, quartz, and mica. The potash feldspar in the Black Hills pegmatite is microcline; the mica is muscovite. In addition to these, the Black Hills pegmatite contains one or many accessory minerals, often to such extent that the essential minerals are distinctly subordinate. Segregations of the essential minerals have permitted their economic extraction, resulting in the feldspar, rose quartz, and mica industries in the Hills. Among the accessory minerals that have been marketed, the following have assumed the importance of being the objectives of mining operations: Albite (soda spar), amblygonite, cassiterite, columbite, hubnerite, lepidolite, pollucite, spodumene, tantalite, and wolframite. Many other relatively rare minerals are segregated enough to be sorted out as byproducts in the mining of one or more of the essential minerals or of the above-mentioned accessory minerals; they include andalusite, apatite, beryl, garnet, lithiophilite, purpurite, scheelite, sillimanite, tourmaline, and triphylite. About 40 other primary minerals[6] have been identified in the Black Hills pegmatite.

HISTORICAL REVIEW OF PEGMATITE MINING

History and Development

Mica (Muscovite)

Muscovite mica was the first of the pegmatite minerals to be mined in the Black Hills. Mica has contributed almost half of the total value of pegmatite minerals mined to date, and the total value of its production far exceeds that of any other pegmatite mineral. The first mica mined in the Black Hills was the sheet variety taken from the Crown mine northwest of Custer in 1879. All the sheet mica produced in the Black Hills has been mined within 10 miles of Custer. The production of sheet mica has alternately prospered and declined; it experienced its greatest prosperity from 1907 to 1911, when the Westinghouse Electric & Manufacturing Co. reopened its New York, White Spar, and Crown mines. During that period of activity the Black Hills yielded about one-third of the mica produced in the United States and South Dakota ranked second among the mica-producing States. Most of the mica produced in the Black Hills since that period has been scrap mica, production of which began about 1900. Sheet mica is no longer produced in the

6/ Connolly, J. P., and O'Harra, C. C., The Mineral Wealth of the Black Hills: South Dakota Sch. Mines Bull. 16, 1929, p. 231.

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ack Hills, and all the scrap mica is hand-sorted as a byproduct incident the mining of some other mineral (especially feldspar, spodumene, or blygonite) except at the Peerless mine near Keystone, where mica is the incipal product.

Lithium Minerals

(Spodumene, Amblygonite, Lepidolite, Lithiophilite, and Triphylite)

The production of lithium minerals followed the production of mica ronologically and to date comprises the second largest value of total pro-ction among the pegmatite minerals. Spodumene was first shipped from the tta mine near Keystone in 1895. That mine produces virtually all the spodu-ne mined in the United States and is the country's greatest lithium pro-cer. Amblygonite was mined first in 1905; large amounts have been shipped rom the Hugo, Peerless, and Ingersoll mines near Keystone and from Tinton.1/ he Ingersoll mine produces most of the lepidolite that is mined in the Black ills; the remainder is recovered as a byproduct at various mines.

Lithiophilite and triphylite are not marketed at present, although over 00 tons of the two minerals have been shipped for their lithium content.

Tin Ore (Cassiterite)

Cassiterite was first identified in placers in the northern Hills in 876; the following year it was found in the southern Hills. The first lode in in the district was found in the Etta mine in 1883. Most of the tin ining in the Black Hills was done by the Harney Peak Tin Mining, Milling, Manufacturing Co. from 1884 to 1894. No tin is now mined in the southern Hills, but some is present in the tantalite concentrate produced at Tinton.

Rose Quartz

Rose quartz has been mined in small quantities since 1889. Most of it s produced at Scott's rose quartz mine near Custer. It is used as a semi-precious and decorative stone.

Beryl

Although first found in 1883, beryl was not mined until 1914. Most of it has been produced as a byproduct at the Peerless, Ingersoll, Beecher Lode, and Dakota mines.

Columbite-Tantalite

These minerals were first mined on a commercial scale in 1918, although hey had been recognized many years earlier. The Black Hills have supplied nearly all the columbite produced in the United States, and about half of

1/ Guiteras, J. R., Mining and Milling Methods and Costs at the Black Hills Tin Co., Tinton, S. Dak.: Bureau of Mines Inf. Circ. 7084, 1939, 16 pp.

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the Black Hills production was mined from the Beecher lode, south of Custer. Tantalite is being mined at Tinton in the Northern Hills.[8]

Tungsten

Virtually all the tungsten mined in the Black Hills is derived from replacements in the Deadwood formation (earliest Cambrian). Pegmatite dikes have contributed only about 1.6 percent of the total value of the tungsten produced in the Hills; they were mined during the war period, 1913-18.

Andalusite and Sillimanite

Small amounts of andalusite and sillimanite were produced by unsystematic methods during 1924, 1925, and 1932. The minerals occur in isolated bunches in the Algonkian schist; their relationship to the pegmatites is not always clear.

Pollucite

Pollucite is an ore of caesium. A carload shipment from the Tin Mountain mine west of Custer in 1928 constituted the total production of this mineral.

Feldspar

(Microcline, orthoclase, plagioclase)

Microcline is the representative of the feldspar group in the pegmatite of the Black Hills; it is the most abundant mineral in the pegmatite. Members of the plagioclase group, especially albite, usually are present, and orthoclase has been reported. Feldspar was not saved in the early mining of other pegmatite minerals. The feldspar industry in the Black Hills began with the advent of lower freight rates to eastern markets in 1923. The industry has grown rapidly, and the annual value of feldspar produced now exceeds that of all other pegmatite minerals combined. In 1938 South Dakota was second only to North Carolina in feldspar production. Except for the Etta, Peerless, and Ingersoll mines near Keystone and two or three small mines near Custer, all the active pegmatite mines in the southern Black Hill are feldspar mines, and the other pegmatite minerals now produced are mined as byproducts.

Production Statistics

Table 2 gives the production of the minerals segregated from Black Hill pegmatite. The data through 1935, were prepared by F. C. Lincoln,[9] profess of mining at the South Dakota State School of Mines and have been brought up date by Dr. Lincoln and Paul M. Tyler, chief engineer, Non-metal Economics D ision, Bureau of Mines (in a letter to the author).

8/ Guiteras, J. R., work cited in footnote 7, p. 11.
9/ Lincoln, F. C., Mining in South Dakota. Part 1 of the Mining Industry of South Dakota: South Dakota Sch. Mines Bull. 17, 1937, pp. 28-29.

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TABLE 2.- Mineral production from Black Hills pegmatites

Year	Beryl		Columbite-tantalite		Feldspar		Lithium minerals		Mica	Rose Quartz	Tin		Tungsten	Andalusite and sillimanite		Pollucite
	Short tons	Value	Pounds	Value	Long tons	Value	Short tons	Value	Value	Value	Pounds	Value	Value	Short tons	Value	Value
1879-1901	-	-	-	-	-	-	-	-	$ 600,000	$ 3,000	206,665	$43,871	-	-	-	-
1902-12..	-	-	-	-	-	-	3,800	$123,500	567,400		107,214	32,482	$ 1,500	-	-	-
1913.....	-	-	-	-	-	-	780	19,500	12,609		1,500	660	3,000	-	-	-
1914.....	6	$ 538	-	-	-	-	46	1,150	7,504		Small production		400	-	-	-
1915.....	-	-	-	-	-	-	256	5,120	10,914		1,805	722	1,425	-	-	-
1916.....	-	-	-	-	-	-	549	10,970	59,770		240	108	12,000	-	-	-
1917.....	-	-	-	-	-	-	1,281	25,620	11,008		22,196	8,275	1,000	-	-	-
1918.....	3	270	4,500	$ 2,250	-	-	1,755	37,100	10,464		240	200	2,000	-	-	-
1919.....	3	180	300	90	-	-			5,245	37,000	0	0	-	-	-	-
1920.....	-	-	4,000	1,450	-	-	2,861	137,480	3,875		12,000	6,000	-	-	-	-
1921.....	2	105	3,400	1,150	-	-			2,290		0	0	-	-	-	-
1922.....	3	157	600	240	-	-			4,980		0	0	-	-	-	-
1923.....	6-1/2	330	1,350	540	150	$ 600	1,052	39,125	6,480		0	0	-	-	-	-
1924.....	-	-	1,197	598	1,800	7,200	1,331	53,833	9,267		0	0	-	4	$ 235	-
1925.....	-	-	0	0	2,000	8,000	1,017	40,900	19,427		0	0	-	16	635	-
1926.....	25-1/4	1,271	2,100	650	4,500	27,000	800	32,000	21,500		0	0	-	-	-	-
1927.....	30	1,500	1,100	378	4,400		329	13,140	26,000		325	200	-	-	-	-
1928.....	-	-	34,899	26,332	5,240	125,000	536	21,450	9,513		4,000	2,000	-	-	-	$2,000
1929.....	222-1/2	12,238	22,117	17,261	3,800		891	33,875		485	500	200	-	-	-	-
1930.....	7	350	4,100	2,870	7,500					1,048	315	100	-	-	-	-
1931.....	-	-	300	210	11,062	39,013	355	12,425	2,400	650	189	50	-	-	-	-
1932.....	-	-	0	0	6,067	22,256	50	2,000	1,949	1,455	1,000	220	-	46	1,600	-
1933.....	83-1/4	2,914	0	0	3,220	12,058	336	10,470	2,400	806	225	88	-	-	-	-
1934.....	25	875	425	168	9,190	30,892	684	20,480	6,650	658	448	234	-	-	-	-
1935.....	60	1,800	7,681	4,521	22,099	62,498	1,154	26,834	3,440	677	800	452	-	-	-	-
1936.....	0	0	0	0	32,144	103,671	1,241	34,273	9,600	1,950	0	0	-	-	-	-
1937.....	40	1,000	16,307	13,317	41,392	158,976	1,357	36,206	9,000	2,616	4,200	2,268	-	-	-	-
1938.....	80	2,000	36,189	35,127	42,297	122,467	678	18,089	13,200	3,780	4,200	1,764	-	-	-	-
Totals..	596-1/2	25,528	140,565	107,152	196,861	719,631	23,139	755,540	1,436,885	54,125	368,062	99,894	21,325	66	2,470	2,000

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SMALL-SCALE MARKETING OF PEGMATITE MINERALS

Pegmatite minerals cover so wide a range of usefulness that they are in demand by many classes of consumers. Table 3 gives the names and addresses of firms that are buyers of minerals from Black Hills pegmatite[10/] and the minerals purchased by each firm.

Most mine operators prefer to sell their production of accessory pegmatite minerals locally rather than hold them until enough has accumulated to justify making a shipment. John Wells, of Custer, has for many years maintained a depository for such minerals. He buys from the miners and ships to eastern markets. Wells contributed the data below on the minerals handled by him.

Amblygonite.- Amblygonite is purchased in amounts of 50 pounds and over at 1-1/2 cents per pound. About 12 miners sell amblygonite locally. The amblygonite is cobbed clean of quartz; it contains about 8 percent lithia as shipped. Railroad shipments have been made during the last 6 years. About 5 or 6 years ago 120 tons was shipped to the Foote Mineral Co., Inc., Philadelphia, Pa. The freight rate was 58 cents per 100 pounds in carload lots, based upon a railroad freight classification of "analogous phosphates." Foote paid $30 per ton for amblygonite, f.o.b. Custer, S. Dak. During the last 4 years amblygonite shipments have been made to the Maywood Chemical Works, Maywood, N. J. The freight rate to Maywood is $16.05 per ton by carload lot. Maywood pays $40 per ton, f.o.b. Custer, for amblygonite containing 8 percent Li_2O, and $1 per ton plus or minus for each 1/10 percent above or below 8 percent. The minimum allowable lithia content is 7 percent.

About 15 percent of the amblygonite shipped is mined from the High Climb lode owned by John Wells and Fred Heidepriem; the remainder is made up of small local purchases.

Mica.- Small lots of mica are purchased from about 50 mine operators; virtually all of them sort it out as a byproduct in feldspar mining. The mica market is erratic; but in August 1938 all that was produced could be sold locally at $10 per ton, sacked and delivered at the storage depot. The mica was sorted as clean as possible. Although it would be possible to hand-sort a small percentage of sheet mica, former experience has proved that the additional value received does not justify the cost of further sorting. All mica is therefore bought and sold as scrap mica; it is ground for use.

The quantity of mica produced in the Custer district depends on the demand for feldspar; and with increased activity in the feldspar industry, more mica is being produced than in the last few years. About six carloads was shipped during 1937. All shipments were made to the United States Mica Co., Forest Park, Ill. The company paid $18 per ton for mica delivered to Forest Park; the freight rate from Custer was $6.50 per ton.

10/ South Dakota State Planning Board, Pegmatite Mining in South Dakota: 1937, p. 60.

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Buyer and address	Amblygonite	Andalusite-sillimanite	Beryl	Columbite-tantalite	Feldspar	Lepidolite	Mica	Spodumene
A. O. Schoonmaker Insulation Co., Inc., 345 Hudson St., New York, N. Y.							x	
Asheville Mica Co., Biltmore, N. C.							x	
Associated Metals & Minerals Corporation, 40 Rector St., New York, N. Y.	x	x	x	x	x	x	x	x
Beryllium Corporation of Pennsylvania, Reading, Pa.			x					
David Taylor Co., 52 Broadway, New York, N. Y.	x		x	x		x		x
Eugene Munsell & Co., 200 Varick St., New York, N. Y.							x	
Fansteel Metallurgical Corporation, North Chicago, Ill.				x				
Foote Mineral Co., Inc., 1609 Summer St., Philadelphia, Pa.	x		x	x				x
Ford Radio & Mica Corporation, 536 63d St., Brooklyn, N. Y.							x	
General Mica Co., Penland, N. C.							x	
Huse-Liberty Mica Co., 171 Camden St., Boston, Mass.							x	
Industrial Mica Corporation, 728-30 64th St., Brooklyn, N. Y.							x	
Minerals & Insulation Corporation, 139-141 Spring St., New York, N. Y.		x					x	
National Sales Corporation, 31-35 E. 13th St., Cincinnati, Ohio					x			
Non-Metallic Ores Co., 1526 W. Cermak Road, Chicago, Ill.							x	
Philipp Brothers, Inc., 70 Pine St., New York, N. Y.	x	x	x	x	x	x	x	x
Seabord Feldspar Co., Hearst Tower Bldg., Baltimore, Md.					x			
Smith Chemical & Color Co., 55 John St., Brooklyn, N. Y.							x	
Tennessee Mineral Products Corporation, Spruce Pine, N. C.					x			
The Macallen Co., The Macallen St., Boston, Mass.							x	
United Feldspar Corporation, 10 E. 40th St., New York, N. Y.					x	x		x
U. S. Mica Manufacturing Co., 1521-1527 Circle Ave., Forest Park, Ill.							x	
Varlacoid Chemical Co., 15 Moore St., New York, N. Y.				x				
Whittaker, Clark & Daniels Co., 260 W. Broadway, New York, N. Y.					x		x	
William Brand & Co., 276 4th Ave., New York, N. Y.							x	
Wishnick-Tumpeer, Inc., 365 E. Illinois St., Chicago, Ill.							x	

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Beryl.- Several feldspar mines contain beryl in adequate quantity to justify sorting it out. In August 1938 John Wells was paying $25 per ton for clean beryl delivered sacked at the storage depot in Custer.

About 2 carload shipments are made each year; they contain over 10 percent BeO. Most shipments are made to the Brush Beryllium Co., Cleveland, Ohio; some are made to the Maywood Chemical Works, Maywood, N. J. The latter company will accept a mixed car of beryl and amblygonite.

The Brush Beryllium Co. pays for beryl at the rate of $4 per unit (20 pounds), f.o.b. Custer. A shipment must assay at least 12 percent BeO. The freight rate from Custer to Cleveland is $12.60 per ton.

The Maywood Chemical Works accepts shipments of beryl that contain 10 percent (or over) BeO. It pays $30 per ton for such material, f.o.b. Custer.

With increased feldspar production, more beryl probably will be shipped in the near future.

Spodumene.- Spodumene has no local market.

Lepidolite.- There is no local market for lepidolite.

Columbite-tantalite.- Very little columbite, possibly 100 pounds in a year, is marketed in Custer. Virtually no tantalite is produced in the district.

The Maywood Chemical Works pays 50 cents per pound, f.o.b. Custer, for columbite concentrate containing 68 percent combined columbium and tantalum oxides. The freight rate to Maywood, N. J., is $2 per 100 pounds.

Sillimanite.- The Champion Spark Plug Co. will pay $35 per ton for clean sillimanite; none is being shipped.

Andalusite.- The Champion Spark Plug Co. will pay $40 per ton for clean andalusite; none is being shipped.

During 1938 none of the following minerals that occur in the pegmatite dikes in the Custer district were marketed: Pollucite, cassiterite, lithiophylite, triphylite, and wolframite.

MINING LAWS APPLICABLE TO PEGMATITE MINERALS

South Dakota is one of the western public-land states; therefore, the Federal mining laws are applicable to mineral deposits on the public domain in the State. Walter G. Miser[11/] has summarized the Federal and State statutes that apply to mining in South Dakota and gives some of the local interpretations of those statutes.

11/ Miser, Walter G., South Dakota Mining Law. Part 2, Mining Industry of South Dakota: South Dakota Sch. Mines Bull. 17, 1937, pp. 44-60.

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Some of the pegmatite area in the Black Hills is included in a part of Harney National Forest, which has been set aside as Custer State Game ctuary. It is necessary to acquire prospecting rights in this area by ob-ning a permit from the forest supervisor; if a valid discovery of mineral ults, the permittee must obtain a special-use permit. Examples of these permits follow.

Prospecting Permit

Permission is hereby granted to John Doe of Custer, S. Dak., to enter the Custer State Park Game Sanctuary, Harney National Forest, and to prospect for minerals upon any vacant lands of the United States therein, excepting upon lands which are used or needed for higher public purposes, and excepting upon lands located within 660 feet of the center line of any Federal, State, or county highway, subject to the following conditions:

1. This permit is issued free of charge under and subject to Regulation L-2 (q) of the Regulations of the Department of Agriculture.
2. The permittee shall comply with the Regulations of the Department of Agriculture governing the National Forest, shall observe all sanitary laws and regulations applicable to the premises, and shall keep the premises in a neat and orderly condition and dispose of all refuse as required by the Forest officers.
3. This permit is subject to all valid claims.
4. The permittee shall take all reasonable precaution to prevent and suppress forest fires.
5. The permittee shall pay the United States for any damage to its property resulting from this use.
6. The permittee shall fully repair all damage, other than ordinary wear and tear, to roads and trails in the National Forests caused by the permittee in the exercise of the privilege granted by this permit.
7. In case of change of address, permittee shall immediately notify the Forest Supervisor.
8. No National Forest timber may be cut or destroyed without first obtaining a permit from the Forest Supervisor.
9. This permit authorizes only the search for undiscovered ore deposits or the investigation of the value of known deposits by exploration, and does not authorize the development, operation, or maintenance of producing mines of any character whatsoever, or the construction of any buildings or other improvements within the boundaries above named. Any such development, operation, maintenance, or construction must be authorized by a separate permit issued for such purpose.
10. No shaft, open-cut, crosscut, tunnel, adit, prospect hole, pit, or trench, shall be sunk, dug, or cut, and no waste shall be deposited or dumped within 660 feet of any Federal, State, or county highway.

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11. Any shaft, open-cut, prospect hole, pit, or trench which, in the opinion of the Forest Supervisor, constitutes a menace to the safety of human beings, wild life, or stock, or which detracts from the scenic beauty and recreational value of the surrounding area, must be filled and packed to the level of the adjacent land before it is abondoned.

12. If a valid discovery is made while exercising the privileges of this permit, permittee shall comply with the laws of the United States and the State of South Dakota in regard to the posting and marking of the boundaries of the area desired to be mined, and the disclosure of vein or lode, and shall immediately make application to the Forest Supervisor for a special use permit to authorize the mining and development of such area. Permittee shall not record a location certificate in the office of the Register of Deeds, but the application for special-use permit shall contain the same information required in such certificate by the laws of South Dakota. Provided, however, that the absence of a valid discovery or the existence of a conflict between the area desired by permittee and an existing or needed use of the land for higher public purposes, shall be cause for the refusal to issue a special-use permit for the mining or development of such area.

13. The permittee shall be considered the preferred applicant for a permit for mining operations in accord with the provision of clause 12, as stated above.

14. The permittee shall take all necessary precautions to prevent the pollution, in any manner whatsoever, of wells or living water.

15. No stock under permittee's control shall be permitted to roam at large.

16. The permittee shall clear to mineral soil, and keep clear an area within a twenty-foot radius of any open or camp fire, and all such fires shall be extinguished before being left.

17. This permit may not be transferred, and shall be immediately revoked upon the violation of any fish and game laws of South Dakota, any rules and regulations governing the Custer State Park Game Sanctuary, or the terms of this permit. Breach of any of the aforementioned laws, regulations, or terms by the permittee or by anyone occupying the premises with his consent, may be cause for the refusal of issuance of future special-use permits for prospecting, or mining development within the said Sanctuary.

18. The tenure of this permit is limited to the duration of the calendar year in which it was issued. Extension and renewal will be made only upon personal application of the permittee.

_____ _____

(Date) Forest Supervisor

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Special Use Permit

Sample Mining Permit

(Case designation)

Permission is hereby granted to (Name of applicant)
of (address)
to use the following-described lands: an area (600 feet in width
(Describe the lands to be occupied, if unsurveyed, by metes and bounds, with references to a road or stream or well-known landmark; right of way by terminal points, direction, and lands occupied).
and 1,500 feet in length)1/ or (not to exceed 20 acres)2/ in the ------ Section ----- T. ------- R. ------, B.H.M., as more particularly shown and described on a map designated "xxxxxxxxxxxx" and dated ---------, a copy of which map is filed in the office of the Forest Supervisor at Custer, South Dakota, and expressly made a part of this permit,

for the purpose of developing and operating a (lode or placer) mine named ----------, and for the construction of the necessary structures appurtenant thereto,

subject to the following conditions:

1. This permit is issued free of charge under and subject to Regulation L-2 (q) of the Regulations of the Department of Agriculture.

2. The permittee shall comply with the regulations of the Department of Agriculture governing the National Forest, shall observe all sanitary laws and regulations applicable to the premises, and shall keep the premises in a neat and orderly condition and dispose of all refuse and locate out-houses and cesspools as required by the Forest officers.

3. This permit is subject to all valid claims.

4. The permittee shall take all reasonable precautions to prevent and suppress forest fires.

5. The permittee, if engaged in business, shall conduct same in an orderly manner and in accordance with all requirements of the laws of the State of South Dakota, as well as the laws of the United States.

6. The permittee shall pay the United States for any damage to its property resulting from this use.

7. The permittee shall fully repair all damage, other than ordinary wear and tear, to roads and trails in the National

1/ For lodes.
2/ For placers.

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Forests caused by the permittee in the exercise of the privilege granted by this permit.

8. Occupancy and use under this permit shall begin immediately, and this use shall be actually exercised at least 25 shifts each year, unless the time is extended or shortened.

9. In case of change of address, permittee shall immediately notify the Forest Supervisor.

10. (Struck out.)

11. No National Forest timber may be cut or destroyed without first obtaining a permit from the Forest Supervisor.

12. Upon the abandonment, termination, or revocation of this permit, and in the absence of an agreement to the contrary, the permittee, if all the charges due the Government have been paid, may, within a reasonable period to be determined by the issuing officer, remove all structures which have been placed on the premises by him, except where the material was furnished by the Forest Service, but upon failure to remove the structures within that period they shall become the property of the United States, but they may not be abandoned to the United States without its consent.

13. This permit may be transferred with the approval of the officer by whom it was given or his successor, subject to such conditions as may be imposed at the time of transfer. It shall terminate upon breach of any of the conditions herein or at the discretion of the Regional Forester or the Forester.

14. The permittee shall provide, whenever requested by the forest officers, a way across the land covered by this permit for the free ingress or egress of Forest officers and for users of National Forest land and purchasers of National Forest products.

15. This permit shall not give the permittee any preference or
(Special stipulations necessary)
right of entry under the mining laws of the United States or the State of South Dakota; title will rest in the United States at all times.

16. This permit authorizes only the development and extraction of minerals, including the construction and maintenance of housing and sanitation facilities incident to human occupation, ore bins, shaft house, blacksmith shop, and similar facilities. This permit does not authorize the construction of any form of ore-reduction mill.

17. No shaft, open-cut, crosscut, tunnel, adit, prospect hole, pit, trench, or structures shall be sunk, dug, cut, or constructed, and no waste shall be deposited or dumped within 660 feet of the center line of any Federal, State, or county highway, or in such locations as to cause the pollution of wells or living waters.

18. Construction of all buildings shall be such that no wood or inflammable material shall be closer than two (2) inches to any flue or chimney. Tile-lined metal stack, equipped with metal roof jack and spark arrester, shall be used for all such flues or chimneys, and if such stack extends through a ceiling, a safety stovepipe thimble shall be used. All stoves shall be placed at least

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18 inches from any wall or partition and four (4) inches above the floor, and shall be adequately guarded by metal or asbestos sheeting.

19. Permittee shall provide and maintain, in a neat and sanitary condition, a sufficient number of fly-proof toilets or latrines of a type, and at locations approved by the Forest Supervisor, to accommodate adequately all persons occupying the permitted area.

20. National Forest timber needed for the construction of buildings and structures used in connection with this permit and commercial timber necessarily destroyed in mining operations shall be paid for in advance at such rates as may be determined by the Forest Supervisor and in accordance with the scale estimate or count of the Forest Supervisor.

21. Any steam or other equipment used in carrying out the purpose of this permit which is likely to cause Forest fires, shall be equipped with suitable spark arresters.

22. Any shaft, open-cut, hole, pit, or trench which, in the opinion of the Forest Supervisor, constitutes a menace to the safety of human beings, wildlife, or stock, shall be fenced with a type of fencing approved by the Forest Supervisor.

23. No stock under permittee's control shall be permitted to roam at large.

24. Permittee shall clear to mineral soil, and keep clear, an area within a twenty-foot radius of any open or camp fire, and all such fires shall be extinguished before being left.

25. This permit confers no rights upon the permittee to the use of any water used in mining operations.

26. This permit does not authorize the construction of any road or trail, and any such construction must be authorized by a special use permit issued for that purpose.

27. The Forest Service reserves the right to inspect the premises at any time and, if considered necessary, to suspend all operations authorized by this permit until the permittee has complied with any clause herein contained, in a manner satisfactory to the Forest Supervisor.

28. This permit shall be immediately revoked upon the violation of any fish and game laws of the State of South Dakota, any rules or regulations governing the Custer State Park Game Sanctuary, or the terms of this permit.

_____ (Date)

_____ Forest Supervisor

This permit is accepted and agreed to under the conditions stated herein.

_____ (Date)

_____ Permittee

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FELDSPAR INDUSTRY IN THE BLACK HILLS

The feldspar industry is a relatively recent development in the mining of pegmatite minerals in the Black Hills; it was inaugurated with a shipment of 150 tons of feldspar from Keystone in 1923. In 1938, with a production of 42,297 tons, South Dakota became the second largest producing State. Table 2 gives the annual production of feldspar in the Black Hills from 1923 to 1938. The industry is centered about the grinding mills at Keystone and Custer. Inasmuch as some mines near Keystone ship to the Custer mill, and some mines near Custer ship to the Keystone mill, the division of the industry into two districts is not definite. The two districts are nevertheless distinct, in that each has a grinding mill that receives the bulk of its crude feldspar from more or less characteristic sources - the Keystone mill from a few large near-by mines, the Custer mill from many scattered small mines. Figure 1 shows the approximate situation of pegmatite mines in the Keystone district and the prospects of the Consolidated Feldspar Corporation in the Custer district. Figure 2 shows the approximate situation of pegmatite mines in the Custer district and other mines that ship to the Custer mill.

Keystone District

The Keystone district includes the largest and most spectacular pegmatite mines in the Black Hills - the Hugo feldspar mine, the Etta spodumene mine, the Peerless mica mine, and the Ingersoll lepidolite mine. There are also many smaller mines in the district.

Consolidated Feldspar Corporation

The Consolidated Feldspar Corporation of Trenton, N. J., operates the Hugo mine, the largest feldspar mine in the Black Hills. The corporation also operates a grinding mill at Keystone, one of its 13 plants situated at various points in the United States. Electric power for the mine and mill is generated at the company 6-cylinder Diesel-engine plant at Keystone.

Grinding Mill at Keystone

The grinding mill was built in 1929; previous to that date only crude feldspar had been shipped from the Black Hills. The mill has a grinding capacity of 220 tons of feldspar per 24 hours. In 1936 the mill ground the output of the Hugo mine. In 1937, in addition to the 16,088 tons produced by the Hugo mine, feldspar was purchased from other local properties and was milled. During 1938 the company has been buying feldspar from near-by operators; this will be milled in addition to the 12,000 tons estimated from the Hugo mine. In September 1938 the mill was operated 65 hours per week.

Figure 3 shows the flow sheet of the mill.12/ The crude spar is delivered to the mill by truck; company-owned trucks haul from the Hugo mine. The

12/ South Dakota State Planning Board, Pegmatite Mining in South Dakota: 1937, p. 34.

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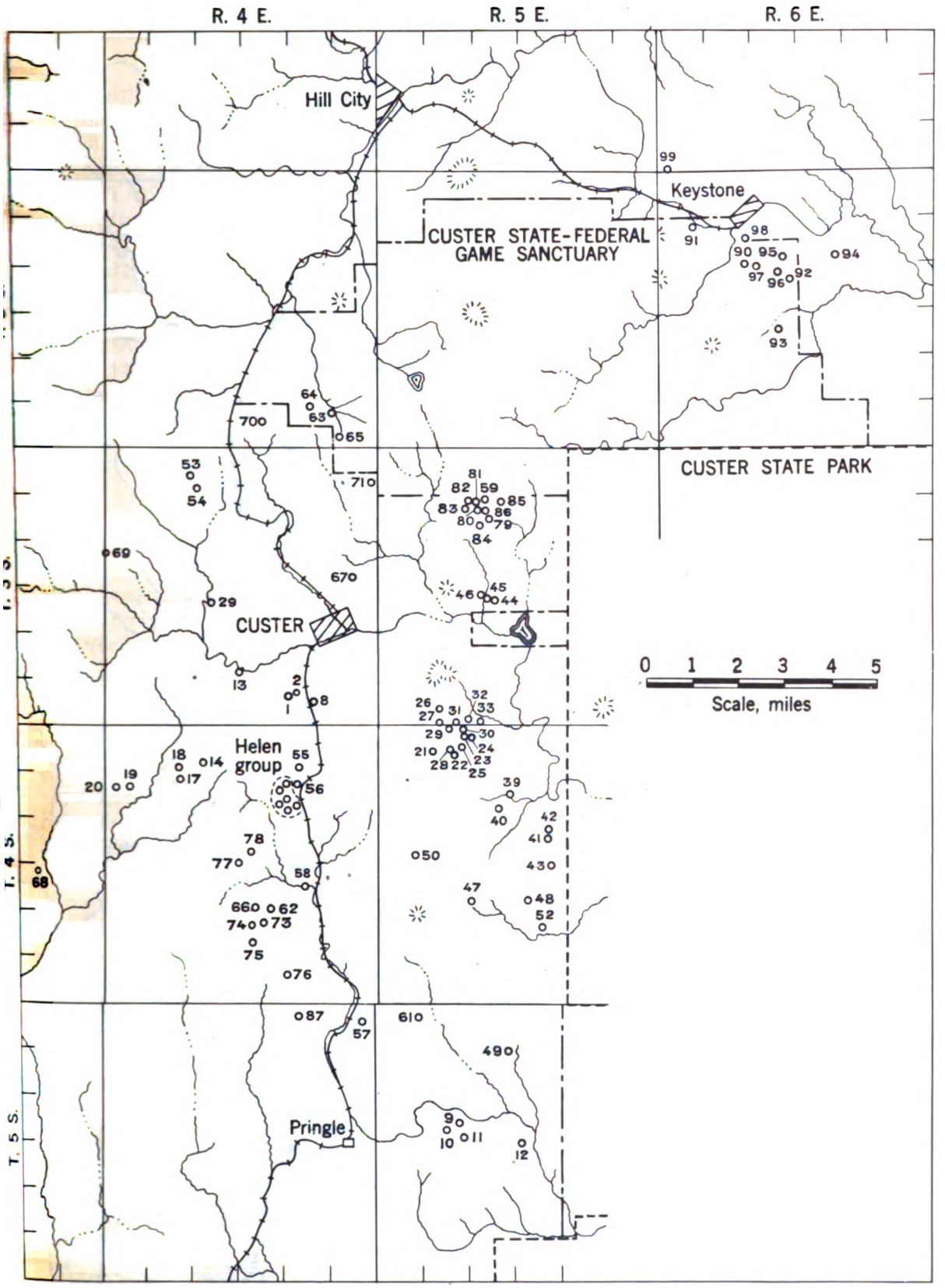

Figure 1.—Pegmatite mines in Keystone district, and Prospects of Consolidated Feldspar Corporation in Custer district.

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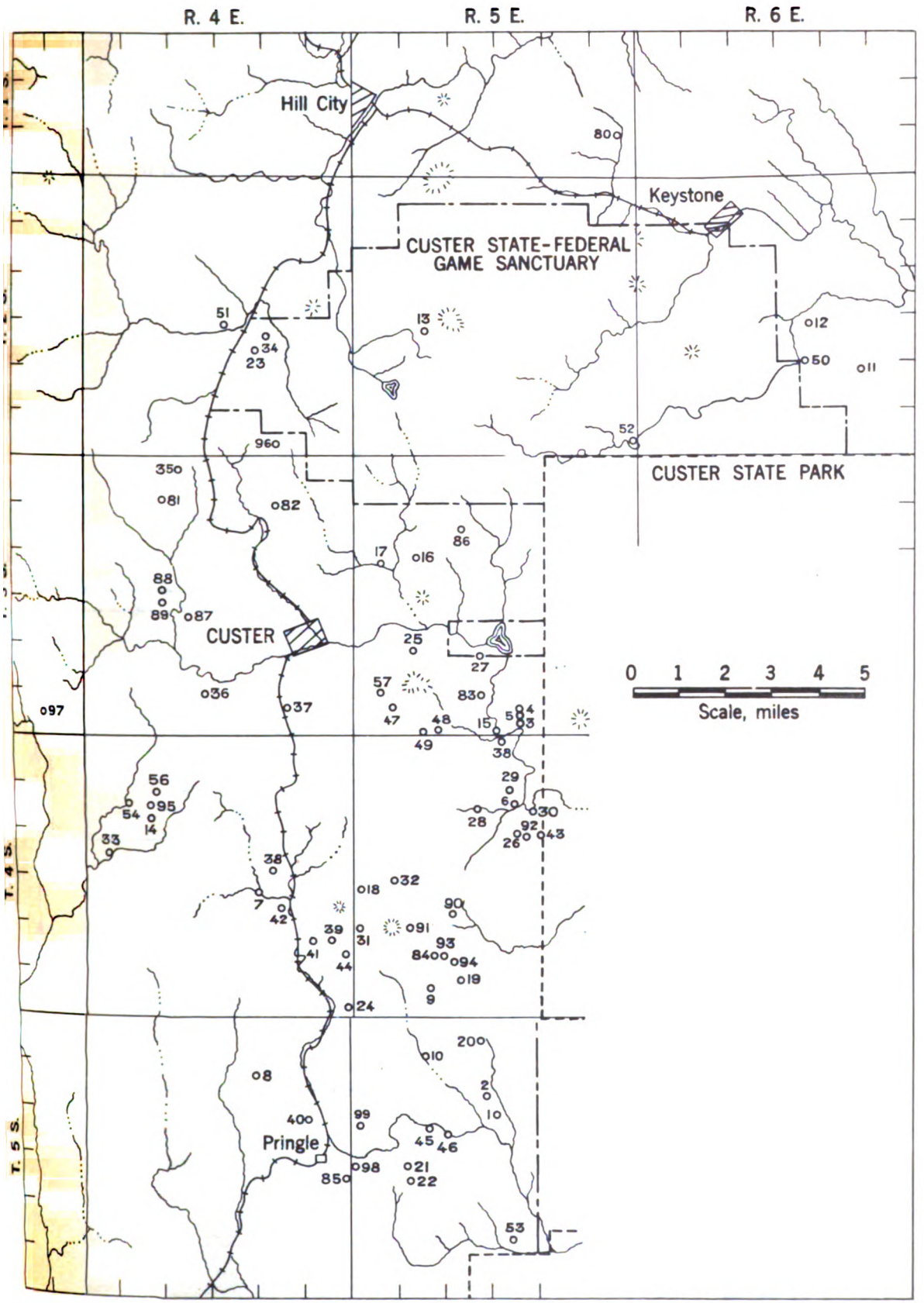

Figure 2.—Pegmatite mines in Custer district, and other shippers to Custer mill.

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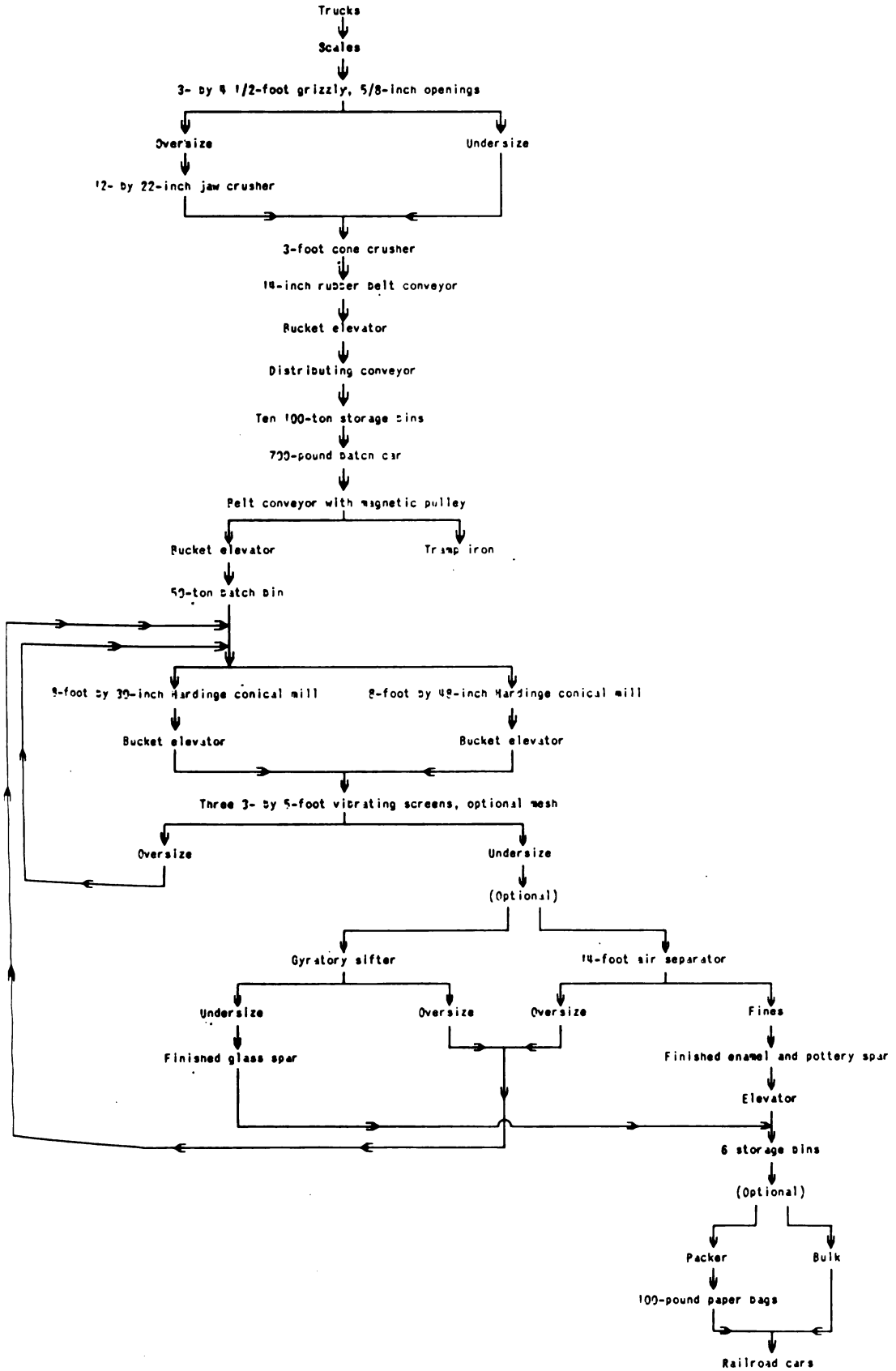

Figure 3.- Flow sheet of grinding mill, Consolidated Feldspar Corporation, Keystone, S. Dak.

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ded trucks after first being weighed at the mill office dump the spar
to a 3- by 4-1/2-foot grizzly with 5/8-inch spaces. Some spar is stock-
iled in a shed. The grizzly oversize is fed to a 12- by 22-inch jaw crusher
iven by a 25-horsepower motor. The crusher discharge and the grizzly under-
ize pass to a 3-foot cone crusher, the product from which is delivered by a
-inch rubber-belt conveyor to the boot of a bucket elevator. The bucket
evator delivers the spar to a distributing conveyor running over the tops
ten 100-ton bins. An automatic tripper on the distributing conveyor
rmits the spar to be discharged into any bin. A batch car holding 700
unds receives the crushed spar from the various bins in the proportions de-
red and delivers it to a belt conveyor equipped with a magnetic pulley for
moving tramp iron. The conveyor delivers the spar to a bucket elevator,
ich discharges it into a 50-ton batch bin. The bin feeds two Hardinge
nical pebble mills, one 8 feet by 30 inches, driven by a 60-horsepower
tor, and the other 8 feet by 48 inches driven by a 100-horsepower motor;
x-rope drive is used. The mill linings and the grinding pebbles are Min-
sota jasper. The discharge from each mill is raised by a bucket elevator
three 3- by 5-foot vibrating screens, which are equipped with removable
reens to produce the desired size of product. The screen oversize is re-
rned to the pebble mills. The undersize is prepared for shipment as glass
ar or as enamel and pottery spar, as the trade requires. To produce glass
ar, the screen undersize is sifted in a gyratory screen. The undersize is
finished product for the glass trade. It is stored in one of six large
rage bins, from which it is loaded into railroad cars on a spur of the
icago, Burlington & Quincy R. R. When it is desired to produce a fine
oduct for the enamel or pottery trade, the undersize from the vibrating
reens is treated in a 14-foot air separator. The oversize from the gyratory
fter or the air separator is returned to the pebble mills. The fines from
e separator are elevated to one of the six storage bins for shipment.
ther grade of ground product may be shipped in bulk or sent through a me-
nical packer when it is put up in 100-pound paper bags.

Table 4 gives the analysis of feldspar shipped by the Consolidated Feld-
ar Corporation on September 23, 1938.

TABLE 4.- Feldspar analysis, Consolidated Feldspar Corporation

	Percent
SiO_2	66.1
Fe_2O_3	.05
Al_2O_3	18.8
CaO	.1
MgO	Trace.
Na_2O	3.3
K_2O	11.2
Loss on ignition	.3
Total	99.85
P_2O_5 (variable)	0.2 to 0.7

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Pegmatite Mines in the Keystone District

The Consolidated Feldspar Corporation operates several mines in the Keystone district and owns about 72 prospects in the Custer district. The prospects, as well as the mines in the Custer district that ship to the Keystone mill, are described under the Custer district.

The Hugo mine, operated by the Consolidated Feldspar Corporation under lease, is the main source of feldspar for the Keystone grinding mill. The Dan Patch No. 3 lode, owned by the corporation, is being held in reserve. Descriptions of these mines follow:

Hugo Mine

No. 90 on figure 1. Date of inspection: September 30 and October 1, 1938.

Situation.- In secs. 8 and 17, T. 2 S., R. 6 E., B. H. M., about 1/2 mile due south of the Peerless mine.

Ownership.- Hugo Reinbolt. The property was leased to Ernest Rickett and subleased to the Consolidated Feldspar Corporation, the operating company

Geology.- A pegmatite dike in schist contains potash feldspar and soda feldspar, quartz, mica, tourmaline, amblygonite, lepidolite, spodumene, a little blue apatite, and lithiophilite. The potash feldspar, microcline, predominates. It is clear and of good quality and is the chief product for which the property is operated; other minerals are produced as byproducts. The quartz is also clear. The mica (muscovite) occurs in large books in zones. Most of the tourmaline is very coarse and easily sorted out. Gray lepidolite occurs in the soda spar. Pure white amblygonite occurs massive in the floor of the first level near the south wall. Also, on the first level is a zone of spodumene; some of the logs are 6 feet long.

Operation.- The Hugo pegmatite was located during a search for a tin deposit. The principal mineral in the early life of the mine was mica, but since 1924 feldspar has been the primary product mined. Mining is carried on in open-cuts. The top of the main pegmatite knob was originally about 90 feet above the present upper bench or No. 1 level. The upper half of the intervening ground has been mined, leaving only a pillar of mixed feldspar and quartz 40 to 50 feet high on the south side of the main workings on the No. 1 level. In October 1938 no work was being done on the No. 1 level, although previously two men had been mining along the east wall of the level where some of the best spar occurred. The No. 2 level comprised two benches on the north side of the knob 50 and 75 feet, respectively, below the No. 1 level. The upper No. 2 level was a cut about 20 feet wide and 50 feet long; the face extended up to the No. 1 level. Two men were sorting out spar and loading it into a 1-ton mine car, which was trammed 50 feet and dumped in a chute to the lower No. 2 level. The spar was loaded on this level into another 1-ton car and trammed 100 feet to a loading bin. The lower No. 2 cut was 50 feet wide and has been driven about 50 feet; the face was 75 feet high. Two men were

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:ting out spar and tramming it 100 feet in a 1-ton car to the loading bin
itioned above. The No. 3 level was on the west face of the hill about 100
:t below the No. 1 level. The cut was 50 feet wide and 75 feet long; the
:e was 70 feet high. As the cut advances, the face approaches the No. 1
vel. Four men sorted out spar into two 1-ton cars and trammed them 50 feet
a 50-ton loading bin. In loading cars in the cuts, the men used forks on
e mixed material and shovels on the fines. Excess fines from high benches
s dumped for waste. The coarse spar was sorted out and thrown to one side;
:er it was forked into a car. The men were paid $1.00 for every ton of
lispar delivered to the bins. A miner was employed at drilling and blasting
e faces of the cuts as needed; he was paid $5.00 per day. Good and poor
ar was broken down in proportions to enable the sorters to earn fair wages.
r for drilling was supplied by an electrically driven compressor on No. 1
vel. Electric power was supplied by the company power plant at Keystone
ee p. 22). Drilling was done with a jackhammer, using detachable bits and
8-inch steel with a maximum length of 14 feet. The 10 sorters could pro-
:e about 1,200 tons of feldspar per month. Two company trucks, a 1-1/2-ton
uck hauling a 4-1/2-ton load and a 3-ton truck hauling a 9-ton load, trans-
rted the spar from the mine bins to the mill at Keystone. The smaller truck
uled from the No. 2-level bin a distance of 1 mile; the larger truck hauled
om the No. 3-level bin a distance of 1-3/8 miles. The two trucks together
uld haul 20 tons of spar per hour to the mill. Besides hauling from the
go mine, the same trucks hauled spar from the Dan Patch No. 3 mine and lepido-
:e (about 100 tons per month) from the Ingersoll mine.

At the south base of the hill, 150 feet below the No. 1 level, a drift
i been driven 320 feet into the pegmatite. The drift cut 30 feet of pegma-
:e "casing", then 15 feet of schist, 195 feet of pegmatite, 20 feet of
hist, 50 feet of pegmatite (including some good soda spar), and 10 feet of
hist. At a point in the drift 140 feet in from the portal, a 5- by 7-foot
ploratory raise has been begun. Drilling and blasting in the raise were done
/ the surface driller; he worked about 2 days a week in the raise. The raise
s expected to hole through on the hillside between the upper No. 2 level and
e No. 3 level. Air for drilling in the raise was supplied by a portable
mpressor at the portal of the drift.

In addition to the feldspar production, 2 carloads of mica and one-half
arload of amblygonite were sorted out and stored on the No. 1 level; 1 carload
f mica, 5 tons of amblygonite, and 200 pounds of beryl were stored on the
wer No. 2 level.

The Hugo mine has produced about 200,000 tons of feldspar. In 1937 the
oduction was 16,088 tons. The production for 1938 (estimate made in October
938) probably will be about 12,000 tons.

an Patch No. 3 Lode

No. 91 on figure 1. Date of inspection: September 30, 1938.

Situation:- In NE1/4 sec. 7, T. 2 S., R. 6 E., B. H. M.; about 3/4 mile
west of the Keystone railroad depot.

360

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Ownership.- Consolidated Feldspar Corporation.

Geology.- A nearly vertical pegmatite dike in schist strikes northeast. The outcrop is about 200 feet long and 100 feet wide. The dike contains blocky feldspar of good grade, considerable quartz, mainly in bunches with mica, a little beryl, and very little tourmaline.

Operation.- A main pit was 50 feet long and 20 feet wide; the walls were 10 to 30 feet high. Entry to the pit was by means of an adit 20 feet long, which penetrated schist for the first 10 feet, then pegmatite. The property was idle when visited, being held in reserve. Earlier in the year two men had been employed to break and sort the rock; drilling was done 1 day per week by a company driller. About 60 percent of the broken rock was hand-sorted for spar. It was trammed 50 feet in a 1-ton mine car to a 50-ton bin. The two men hand-sorted about 250 tons of spar per month. A smaller pit, about 25 feet west of the larger one, was 25 feet long and 20 feet wide, and the face was 25 feet high. The dike produced 400 tons of feldspar in 1937 and 800 tons in the first 9 months of 1938. About 3 tons of mica, 1 ton of beryl, and 500 pounds of amblygonite had been hand-sorted. The amblygonite occurred in only one pocket.

Many smaller dikes near Keystone have contributed to the feldspar production of the district; those visited in the fall of 1938 are described briefly in the following pages.

Confidence No. 1 Lode

No. 92 on figure 1. Date of inspection: October 1, 1938.

Situation.- In SE1/4NE1/4 sec. 16, T. 2 S., R. 6 E., B. H. M.; in Greyhound Gulch, 1 mile due east of the Etta mine.

Ownership.- Stratton Bros.

Geology.- A pegmatite dike contains blocky feldspar, quartz, and mica. The spar is iron-stained and contains some mica but no tourmaline.

Operation.- A cut 50 feet wide was driven 10 feet; the face was 20 feet high. In former years, 3 or 4 carloads of feldspar was shipped to Denver. The property was idle when visited.

Dike Lode

No. 93 on figure 1. Date of inspection: October 1, 1938.

Situation.- About 4 miles southeast of Keystone.

Ownership.- R. A. Smith.

Geology.- A pegmatite dike contains feldspar of good quality with streaks of quartz and mica. Some lithiophilite is present, but no tourmaline. Spodumene logs have been found at one place, and a little beryl also has been found.

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Operation.- A cut 5 feet wide was driven 20 feet, then widened to 25 t and driven 25 feet farther; the face was 30 feet high. In September 3 the property was leased to H. D. Swanzey. Drilling was done as needed the Consolidated Feldspar Corporation at $18 per day. Swanzey sorted out spar and wheeled it 50 feet in a barrow to a loading chute. His dyna- e cost $15 per hundred pounds, which he paid for in feldspar. Hauling r to the mill at Keystone, 4 miles, cost 50 cents per ton. He received .75 per ton of spar delivered at the mill. About 400 tons of feldspar has n shipped; 1 ton of beryl was sold; about one-half a ton of spodumene and to 300 pounds of mica have been sorted out.

tson Mine (Phillip and Phyllis Lodes)

No. 94 on figure 1. Date of inspection: October 12, 1938.

Situation.- In SE1/4 sec. 10, T. 2 S., R. 6 E., B. H. M., about 3 miles st of Keystone.

Ownership.- Steve Watson

Geology.- A pegmatite dike in schist contains iron-stained feldspar and artz; no mica or tourmaline is present.

Operation.- A cut 30 feet wide was driven 100 feet; the face was 30 feet gh. Formerly, spar had been shipped to the Consolidated Feldspar Corpora- n mill at Keystone. The property was idle when visited.

ison Dike (Sitting Bull Lode)

No. 95 on figure 1. Date of inspection: October 12, 1938.

Situation.- In SE1/4 sec. 9, T. 2 S., R. 6 E., B. H. M.

Ownership. Thos. A. Edison, Inc.

Geology.- A pegmatite dike in schist contains feldspar, quartz, mica, d spodumene. The minerals are iron stained and mixed. The spodumene is al- ered.

Operation.- A cut 50 feet wide was driven 50 feet; the face was 40 feet igh. The sides of the cut have fallen in, partly filling the original ex- vation. Spodumene had been shipped about 1917; the property has long been ne.

ing Mica Lode

No. 96 on figure 1. Date of inspection: October 12, 1938.

Situation.- In NW1/4NE1/4 sec. 16, T. 2 S., R. 6 E., B. H. M.

Ownership.- Friend G. Robertson.

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Geology.- A pegmatite dike in schist contains blocky feldspar, quartz, mica, and tourmaline. The feldspar is iron stained, otherwise of good quali

Operation.- A cut 30 feet wide was driven 85 feet; the face was 35 feet high. Two men sorted the spar and wheeled it 100 feet in a barrow to a 100-ton bin. It was shipped to the Consolidated Feldspar Corporation at Keystor The property was idle when visited.

Much has been written about the Etta spodumene mine, the Peerless mica mine, and the Ingersoll lepidolite mine; references are given in the bibliography. These mines are briefly described in the pages that follow.

Etta Mine

No. 97 on figure 1. Date of inspection: October 7, 1938.

Situation.- In NW1/4 sec. 16, T. 2 S., R. 6 E., B. H. M.

Ownership.- Maywood Chemical Works, Maywood, N. J.

Geology.- An elliptical pegmatite mass about 400 feet long and 250 feet wide is encased in a band of granoblastic rock ranging in thickness from 4 t 40 feet and surrounded in turn by a schist with nearly vertical cleavage planes. The central pegmatite contains feldspar, quartz, mica, abundant large logs of spodumene, and bunches of tourmaline. A mica zone constitutes the outer rim of the pegmatite.

Operation.- The Etta mine was located as a mica mine about 1883. It pr duced the first lode tin mined in the Black Hills, being included in the old Harney Peak Tin Mining, Milling, & Manufacturing Co., which collapsed in 189 During the last 30 years, the present owners have worked the mine for spodumene. One carload of mica was shipped. The crown of the original deposit was probably 200 feet above the present upper-tunnel level. The present haulage level is 56 feet below the upper tunnel. A lower stoping level is 65 feet below the haulage level. The headings are 6 by 7 feet; they are untimbered. A shrinkage stope 25 feet wide and 75 feet long was started from thr chutes on the lower level and carried up to the haulage level; it was left full. From the haulage level, 13 vertical raises 6 by 6 feet in section wer driven to the surface. No regular system of spacing was followed. The rais were reamed with stopers; then the tops were funneled with jackhammers to form glory holes. Both types of drills used 1-inch hollow octagon steel wit conventional bits. Air for drilling was supplied at 85 to 90 pounds per square inch by a 450-cubic-foot compressor driven by a 3-cylinder Diesel engine. Gelatin dynamite of 40 or 45 percent strength was used for blasting. In October 1938 rock broken in the glory holes dropped to a chute on the haulage level, where it was sorted. By means of a board gate in the chute to control the flow the fine material and waste were loaded into a 1-ton mine car. Spodumene was hand-sorted at the chute by two men and thrown into another mine car on a parallel track. Track rails were 12-pound; track gage was 18-inches. Each day about 1 mine car of spodumene was sorted out to 10 cars of waste. The spodumene and waste were trammed about 500 feet by the sorters

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nd dumped in a bin or over the waste dump. The sorters worked 5 days a eek (40 hours); they were paid $4.75 a day. Five men usually were employed. ne man was the blacksmith, two others did the necessary drilling and blasting in the glory hole, but all spent most of their time sorting. In October 938 work in the glory hole was limited to trimming the walls to make it safe o mine to lower levels. At that time demand for spodumene was slack. The nd-sorted spodumene was being stored in the mine; no shipments had been ade during the 5 preceding months. During normal times 10 men were employed; wo 40-ton cars of spodumene were shipped each month. Spodumene production or 1936 was about 640 tons; for 1937 it was about the same. The spodumene hipped averaged about 6 percent lithia (Li_2O).

Peerless Mine

No. 98 on figure 1. Date of inspection: October 8 and 11, 1938.

Situation.- In sec. 8, T. 2 S., R. 6 E., B. H. M.

Geology.- A pegmatite mass in schist contains a great assortment of minerals.

Operation.- The Peerless mine began operations in 1878 as an amblygonite mine. A variety of pegmatite minerals has been mined from time to time. Mica has been mined since 1924 and in 1938 was the principal product; other minerals were regarded as byproducts. In October 1938 mica was mined in a cut 100 feet long. For the first 75 feet the cut was driven 10 feet wide through schist. It was then driven 25 feet wide in pegmatite for 25 feet. The face was 20 feet high and contained abundant large bunches of mica. About 20 percent of the rock broken was sorted for mica. Four men worked 7 days a week. They cobbed about a carload of mica a week; that is, each man cobbed one-half to three-fourths ton of mica per day. All mica produced was sold as scrap.

About 1 ton of soda spar was sorted out per week; 2 carloads was on hand. About 1 ton of beryl was sorted out per month; 12 to 15 tons was on hand. About 1 ton of amblygonite was sorted out each year; about 5 tons was on hand. Cassiterite occurred in some of the soda spar. About 1,500 pounds of a soda-spar-cassiterite mixture was on hand; about two-thirds of it was cassiterite. A little cassiterite and columbite-tantalite were sorted out at the face. The face also showed some good potash feldspar free from tourmaline.

Ingersoll Mine

No. 99 on figure 1. Date of inspection: October 12, 1938.

Situation.- In N1/2NW1/4 sec. 6, T. 2 S., R. 6 E., B. H. M.

Ownership.- The property comprises the Bob Ingersoll, Ben Butler, and Horace Greeley lodes; it is owned by the Black Hills-Keystone Corporation.

Geology.- Three pegmatite dikes about 300 feet apart in schist strike northerly and dip steeply to the east.

7560

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Lower dike.- The most westerly of the dikes, known as the "lower" dike, has a length of about 200 feet and a maximum width of 80 feet. It contains potash and soda feldspar, quartz, mica, beryl, lepidolite, amblygonite, spodumene, and tourmaline. The minerals are fairly well segregated; most of them can be sorted out profitably.

Operation.- A cut 10 feet wide was driven 25 feet normal to the strike of the dike, then turned and driven along the strike for 50 feet; the face was 70 feet high. Since March 1938 about 100 tons of lepidolite has been shipped every 6 weeks. During this period 2 cars of soda spar and 1 car of mica have also been shipped; 15 tons of beryl, 2 tons of amblygonite, and 1 ton of spodumene have been stored.

Lepidolite dike.- The central of the three dikes is known as the lepidolite dike. Lepidolite was mined in a shrinkage stope. The stope was started from a haulage tunnel by driving three short chute raises near the center of the stope, belling out the tops to connect, then enlarging to the full section of the stope, 22 by 40 feet. The stope advanced upward on a slope of 60°. The inclined distance from the haulage level to the surface is 122 feet and for the first half of that distance the stope face was advanced full size. Later, a section 6 feet high and 10 feet wide in the upper right corner of the face was carried ahead as a pilot stope. On October 12, 1938, the face of the pilot stope lacked 35 feet of breaking through to the surface. When it connects, the rest of the main stope face will be slabbed. The slabbing operation will proceed from the bottom upward. During the driving of the pilot stope, four men were employed - one miner at $4.50 per day, one helper at $3.50 per day, and two trammers and sorters at $3.50 per day. Drilling in the face was done with a stoping drill. A 6-foot round of 9 to 13 holes was drilled in one shift. Seven to eight sticks of gelatin dynamite were used in each hole. A jackhammer was used for blockholing; 8 to 20 boulders were drilled and blasted each shift. A total of 300 pounds of dynamite was used per week. The costs of blasting supplies were: Dynamite, $16.48 per 100 pounds; fuse, 77 cents per 100 feet; caps, $1.80 per hundred. Both the stope and the jackhammer used 1-inch hollow quarter-octagon steel with detachable bits. Drill steel cost 16 cents per pound. New bits costing 33 cents each were reground three times. Each regrinding cost 10 cents. The bit cost was 4.4 cents per foot of hole drilled. Air for drilling was supplied by a 220-cubic foot compressor driven by a gasoline engine; the gasoline consumption was 300 gallons per month.

A 4- by 7-foot, two-compartment, 60° raise paralleled the stope; it was driven at a cost of $11.42 per foot. Crosscuts from the raise at 15-foot intervals served successively as manways to the stope.

Rock broken in the stope was loaded into 1-ton mine cars on the haulage level through board gates at the bottom of the chute raises. The chutes were 350 feet in from the portal of the haulageway. The rock was trammed to loading bins 100 feet beyond the portal, making the total tramming distance 450 feet. The 1-ton cars were dumped over a 1-inch grizzly into a hopper. The fines were delivered through a chute to the waste dump. The oversize was hand sorted into three products - first-grade lepidolite was thrown into one

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our 50-ton bins; a lepidolite-soda-spar mixture was stored on one side; the remainder was thrown into the waste chute. The two trammers and ers trammed about 70 tons of rock each week, which yielded 9 to 15 tons first-grade lepidolite and 1-1/2 to 2 tons of lepidolite-soda-spar mix-; the rest was waste.

The first-grade lepidolite contained a little over 2.5 percent lithia O). It was sold to the Consolidated Feldspar Corporation, which hauled o its mill at Keystone, where it was ground to 20 mesh. The ground pro- was sold to the Corning Glass Works of Corning, N. Y.

The direct mine development cost was 40 to 50 cents per ton of lepido- e. The total direct cost of mining, including sorting, was $9.00 per ton lepidolite; overhead was $3.00 per ton additional. These costs do not in- le taxes, insurance, depreciation, or depletion.

Custer District

Crude feldspar was shipped from the Custer district in 1935, and in 1936 F. E. Schundler Feldspar Co., Inc., built a grinding mill at Custer. At st the crude spar for the mill was mined from the dikes mined by the com- , but about May 1, 1937, spar was purchased by the mill from other nearby es. In July 1938, 52 small, independent operators were contributing crude r to the mill, and their number has grown steadily. Table 5 shows the s of feldspar purchased from each of the 77 producers, including the com- -operated properties, during September 1938. The policy of the milling any to purchase all the clean spar available has led to intense develop- t of the pegmatite dikes in the district; thousands of lode locations were e in the last 2 years. Farmers and ranchers having pegmatite dikes on ir properties found it profitable to utilize their spare time mining feld- r and sorting out other pegmatite minerals as byproducts. The F. E. ndler Co. encouraged such operations by furnishing a miner with a portable pressor to do the necessary drilling. As a result feldspar is now hauled the Custer mill from many small operations within a radius of about 20 es. The company hauls acceptable spar to the mill for 50 cents per ton. rators who are near the mill haul their own spar, leaving the longer hauls the company. The company trucks haul 1/3 to 1/2 of the total tonnage of r ground by the mill. On August 12, 1937, the company began stock-piling dspar at the mill, and by October 6, 1938, about 6,200 tons of crude spar on hand.

Nearly all the pegmatite dikes mined in the Custer district during 1938 e mined principally for feldspar; accessory minerals sometimes were hand- ted as byproducts. The district also includes the most famous mica mines the Black Hills, none of which are now producing mica but some of which e become prominent feldspar producers. The White Elephant mine of the ngdon Sanitary Manufacturing Co., the largest feldspar mine in the Custer strict, ships crude spar to Abingdon, Ill. The Consolidated Feldspar Corp- ation owns 72 dikes in the Custer area; most of them are feldspar prospects. few dikes in the district are operated primarily for lithium minerals. The ous Beecher lode and the Tin Mountain mine were idle in 1938 but are poten- al sources of some of the relatively rare pegmatite minerals.

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TABLE 5.- Feldspar purchased by Schundler mill, September 1938

Operator	Tons	Operator	Tons	Operator	
Smith Bros.	62.60	K. Beck	109.21	E. Wilkinson	
Carroll Creek Mfg. Co.	51.30	R. C. Reuwsaat	9.04	F. Roufs	
J. C. Merrick	21.36	R. Yaap	48.00	L. Smith	
A. Johnson	134.55	O. Borgen	4.92	Tom Raby	
L. LaRue	39.55	P. Martin	9.16	Wilkinson & Muhn	
S. Gira	14.35	G. Bland	10.65	P. Kent	
R. Martin	67.95	H. Grass	33.17	H. Brown	
M. A. Bossingham	180.25	M. Germann	60.36	Ray & McConnell	
F. Heidepriem	68.70	J. Wells	5.38	C. Roseberry	
J. Champion	1.50	O. Eaton	3.41	E. L. Davis	
Geo. Barnes	5.05	Shindelbower	15.37	A. Moran	
L. Wood	15.70	C. Dubro	51.71	W. Nevin	
O. Reed	62.45	A. Harball	13.74	D. Virtue	
L. Burrow	57.10	Stratton & Coolie	8.47	L. Parker	
J. Phelps	67.98	G. Cantu	11.26	L. Miller	
W. A. Carson	55.10	E. Howard	43.97	C. Tillotson	
Carol C. Goddard	1.80	Edwards & Bethel	3.00	J. Moye	
H. L. Case	6.00	J. Lilly	31.92	Tinsley & Durst	
Coolie & Stratton	8.38	R. Wineteer	40.29	C. Alger	
E. A. Staudy	239.68	D. Shellhart	10.99	C. Wheeler	
B. McRobbie	88.66	Raver & Michaud	52.53	Geo. Dohrman	
B. Dilley	164.35	H. L. Hoefert	13.47	A. Walton	
P. Byers	136.55	R. Gould	39.59	R. Davis	
J. Ross	138.86	F. Brown	15.75	R. Meeker	
G. McCoy	49.16	C. E. Donnelly	5.70	D. McRobbie	
Brown & Sanders	15.02	Harris & Butts	80.75	Total	2,3

All of the active properties in the Custer district and some of the idle were visited in the summer and fall of 1938 and are described below.

F. E. Schundler Feldspar Co., Inc.

Grinding Mill at Custer

The grinding mill of the F. E. Schundler Feldspar Co. is situated about or half mile south of Custer. The flow sheet is shown in figure 4. Table 6 shows the tonnage of feldspar received each month by the mill during 1937 and the fir 9 months of 1938. The company pays $2.50 per ton for crude spar delivered at t mill. Spar arriving at the mill is first weighed and then either stock-piled o dumped into the mill hopper. The hopper feeds a 12- by 20-inch jaw crusher dri by a 25-horsepower motor. The spar is crushed to 1-1/4 inches and drops into t boot of a bucket elevator, which lifts it 77 feet to a 3- by 6-foot trommel wit 3/8-inch openings. The trommel oversize passes over a 3/4-inch screen, and the plus 3/4-inch product is delivered to a 50-ton bin. From the bin the spar is f to a 20-inch cone crusher driven by a 25-horsepower motor. The crusher is set

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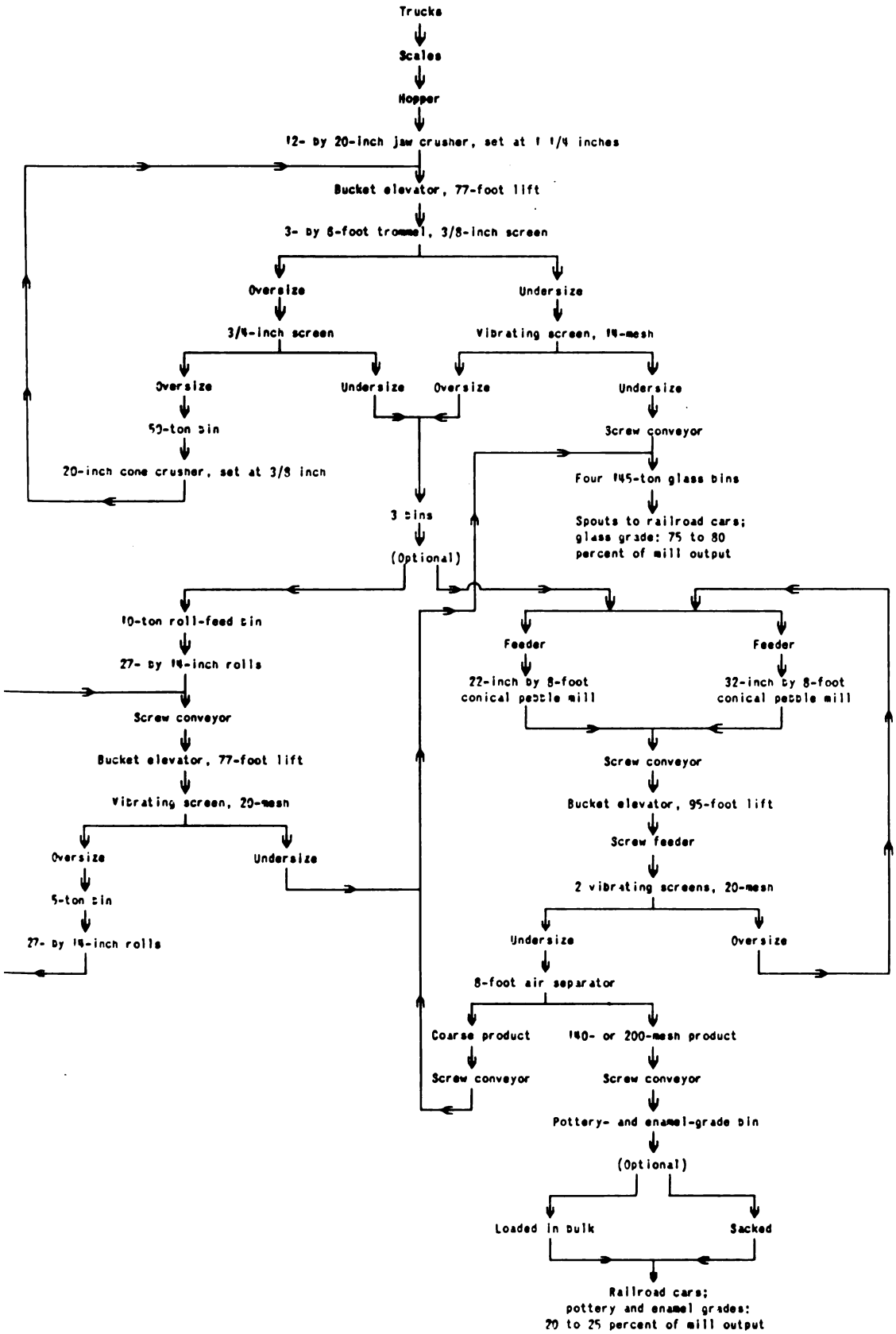

Figure 4.- Flow sheet of grinding mill, F. E. Schundler Feldspar Co., Inc., Custer, S. Dak.

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inch, and the crushed product is returned to the bottom of the bucket vator. The trommel undersize passes to a 14-mesh vibrating screen driven a 2-horsepower D. C. motor. The oversize from the 14-mesh screen and the ersize from the 3/4-inch screen previously mentioned are stored in three ge intermediate bins to await finer grinding in optional circuits. The un- size from the 14-mesh screen is a finished product, designated in the trade 20 mesh.13/

TABLE 6.- Feldspar received at Schundler mill, 1937 and 1938

Month	Tons	
	1937	1938
January	None1/	3,077
February	do.	3,324
March	do.	3,517
April	do.	3,343
May	1,525	2,658
June	996	2,684
July	1,721	2,659
August	2,328	3,920
September	2,322	2,829
October	1,910	-
November	1,807	-
December	2,596	-

1/ The company did not purchase spar before May 1, 1937.

A screw conveyor 30 feet long delivers the finished product to one of four 5-ton glass bins. The conveyor is driven by a 5-horsepower motor. The nished glass spar is loaded through spouts into railroad cars having a capa- ty of 50 to 75 tons.

The plus 20-mesh material in the three bins awaiting finer grinding is ated in one of two optional circuits, depending on whether it is desired to duce additional glass spar or a finer product. For production of additional ass spar the material is transferred to a 10-ton roll-feed bin, from which it fed to a set of 27- by 14-inch rolls. The rolls are driven at 125 r.p.m. by 15-horsepower motor. A screw conveyor delivers the roll product to a bucket evator driven by a 5-horsepower motor. The elevator lifts the material 77 et to a 20-mesh vibrating screen driven by a 5-horsepower D. C. motor. The reen oversize enters a 5-ton bin, from which it is fed to another set of 27- 14-inch rolls. This roll product is returned to the screw conveyor that llows the first set of rolls. The undersize from the 20-mesh screen is a nished glass spar; it is delivered to one of the four 145-ton glass bins pre- ously mentioned.

For production of the 140- or 200-mesh spar for the pottery and enamel in- stries the plus 20-mesh material in the three intermediate storage bins is

13/ For a description of trade classifications of various sizes and grades of feldspar, see: Bowles, Oliver, and Lee, C. V., Feldspar: Bureau of Mines Inf. Circ. 6381, 1930, 21 pp.

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first fed to one of two 8-foot Hardinge pebble mills. One mill is 32 inches in diameter; it carries a 4-ton load of 6-inch flint pebbles and is driven at 24 r.p.m. by a 50-horsepower motor. The other mill is 22 inches in diameter; it carries a 4-ton load of flint pebbles ranging from 2 to 6 inches in diamete it is driven at 27 r.p.m. by a 50-horsepower motor. The total pebble consumption for the two mills is 20 pounds per 24 hours. The discharge from the pebble mills is delivered by a screw conveyor to a bucket elevator driven through speed reducers by a 3-horsepower motor. The elevator lifts the material 95 feet to a screw feeder, which delivers it to two 20-mesh vibrating screens. The feeder is driven by a 3-horsepower A. C. motor; the screen, by a 3-horsepower D. C. motor. The screen oversize is returned to the two feeders immediately preceding the pebble mills. The undersize passes into an 8-foot air separator, in which the blower is driven by a 15-horsepower motor. The air separator may be adjusted to make either a 140-mesh or a 200-mesh product for the pottery and enamel trades. A screw conveyor delivers the fine spar to a bin, from which it is loaded into railroad cars either in bulk or in 100-pound paper sacks. The coarse reject from the air separator is delivered by a screw conveyor to the glass bins previously mentioned, from which it is loaded throu chutes into railroad cars. It requires 2-1/2 hours to load 45 tons of glass spar into a special hopper-bottom 50-ton railroad car and 4 hours to load 45 tons into a boxcar with a loader.

To keep the mill air free from dust the cone crusher is provided with a water seal, and a dust-collector system is used throughout the plant. It is operated by a 5-horsepower motor and collects about 2-1/2 tons of dust per 24 hours. The dust collected is returned to the mill circuit by adding it to the discharge of the pebble mills. About 75 to 80 percent of the output of the m is 20-mesh glass-grade feldspar; 20 to 25 percent is 140-mesh or 200-mesh ena grade or pottery-grade feldspar. Table 7 gives recent analyses of the ground product. Table 8 shows the tonnage of ground feldspar shipped per month duri 1937 and the first 9 months of 1938. Most of the product is shipped to Winchester, Ind., or Lancaster, Ohio. The freight in either instance is $9.60 p ton. Some feldspar is shipped to Pittsburgh, Pa. Sales of ground feldspar a booked in the company office at Joliet, Ill.

The feldspar analyses in table 7 were made September 23, 1937, by the Sm Schurtz Co. at Lancaster, Ohio.

TABLE 7.- Analyses of feldspar milled by the F. E. Schundler Feldspar Co.

	Johnson dike, percent	Smith dike, percent
SiO_2	64.72	64.86
Fe_2O_3	.021	.029
Al_2O_3	19.90	19.68
CaO	.05	Trace
MgO	-	-
Na_2O	3.25	3.22
K_2O	11.96	11.71
Loss on ignition.....	.17	.48
Total.....	100.071	99.979

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TABLE 8.- Mill shipments, Schundler mill

Month	Tons		Month	Tons	
	1937	1938		1937	1938
January.....	1,256	1,862	August.....	1,744	3,235
February.....	1,814	1,970	September.....	1,824	2,779
March.....	1,362	2,960	October.....	2,075	-
April.....	1,531	2,558	November.....	1,872	-
May.....	1,413	3,181	December	1,703	-
June.....	1,059	2,433			
July.....	1,625	2,499	Total	19,278	-

The cost of mill labor is given in table 9.

TABLE 9.- Daily direct mill-labor cost, Schundler mill

Occupation	Number per shift	Man-shift per day	Wages	
			Rate	Amount
Mill man.....	1	3	$5.00	$15.00
Helper.....	1	3	4.00	12.00
Foreman.....	1	1	(1/)	6.67
Mechanic.....	1	1	5.00	5.00
Loader.....	1	1	4.00	4.00
Sacker.....	1	1	4.00	4.00
Totals.....	-	10	-	46.67

1/ Estimated salary, $200 per month.

The operation of the blacksmith shop near the mill was charged to the , although sometimes the shop was used for mill jobs.

Oil and grease for the mill cost $25 per month.

The cost of electric power for milling is about 2 cents per kilowatt- except during the interval of peak load between 4 and 8 p.m., when the t is about 3 cents per kilowatt-hour. The cost of power was $1,100 for a th during which about 3,200 tons of feldspar was ground, or about 34 cents ton of product. Table 10 shows the cost of power for the mill during re- t months.

ing Activities

The F. E. Schundler Feldspar Co. services the mines that sell feldspar to Custer mill and also operates the company-owned mines.

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TABLE 10.- Cost of power, Schundler mill

	Peak loads[1]		Normal loads		Total		$180 demand mining
	Kw.-hr.	Cost	Kw.-hr.	Cost	Kw.-hr.	Cost	
1937.....	77,470	$2,324.10	338,760	$6,775.20	416,230	$9,099.30	$9,903.45
1938:							
January.....	2,950	88.50	6,610	132.20	9,560	220.70	396.20
February.....	5,070	152.10	24,170	483.40	29,240	635.50	743.60
March.....	5,350	160.50	24,230	484.60	29,580	645.10	748.70
April.....	8,590	257.70	41,450	829.00	50,040	1,086.70	1,055.60
May.....	6,250	187.50	30,390	607.80	36,640	795.30	854.60
June.....	8,500	255.00	43,230	864.60	51,730	1,119.60	1,080.95
July.....	5,910	177.30	30,220	604.40	36,130	781.70	846.95
August.....	6,830	204.90	36,730	734.60	43,560	939.50	958.40
September.....	8,790	263.70	31,790	635.80	40,580	909.50	?

1/ Usually between 4 and 8 p.m.

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All the feldspar is mined from open-cuts in the pegmatite dikes. Most the dikes are nearly vertical. The rock is broken by blasting a system vertical down holes drilled across the face of the cut from above; in deep its, several benches are necessary. Many of the miners producing spar in the ister district are without drilling equipment and are inexperienced in the e of explosives. Their "mining" is limited to sorting feldspar and other nerals from the rock that is broken by company miners. The company employs o miners and furnishes each with a portable compressor and jackhammer. ese men are fully employed drilling and blasting for those who require their rvices. Individual properties pay $14 for the services of one miner with mpressor and jackhammer for 8 hours. The portable compressor is gasoline iven, has a capacity of 105 cubic feet per minute, and is of the two-stage type. It supplies air to the drill at a pressure of 100 pounds per square ch. The gasoline consumption is about 2 gallons per hour of drilling. The itfit carries 350 feet of 3/4-inch pipe in addition to the air hose. The ackhammer uses 7/8-inch hollow hexagon steel with forged bits. Dynamite is pplied by the company at $8.50 per 50-pound box, fuse at 75 cents per 100 eet, blasting caps at 2 cents each, and electric caps with 16 feet of wire at) cents each. The company miner does the blasting for those who desire the ervice; more often the operators prefer to shoot a hole or two at a time to ccommodate the work of sorting. When a pegmatite dike is first explored for ts feldspar possibilities the usual practice is for the company miner to rill and blast an entire round. In either instance, down holes are drilled bout 10 feet deep on 5-foot centers. For operators who do their own drilling, onventional forged bits are sharpened by the company for 20 cents each; de-achable bits are ground for 10 cents each.

In the brief descriptions of individual properties that follow, a uniform utline has been adopted to simplify use of the data for reference. The dis-ances given are by road unless otherwise stated. The shape of a mass of in-ruded pegmatite often is not revealed by the outcrop; the designations "dike," vein," "blow-up," "roundish mass," "cupola," "knob," and "intrusion" have not istinct meanings but are suggested by the appearance of the outcrop and by hat has been revealed by mining. The term "feldspar dike" or "spar dike" is sed in the Hills to denote a more or less tabular segregation or zone of feld-par within a pegmatite dike; a spar dike usually parallels the enclosing peg-atite dike. Unless otherwise stated, feldspar or spar implies microcline; ica implies muscovite. "Capping," "casing," and "pegmatite conglomerate" are erms used locally to denote the complex mixture of feldspar, quartz, and mica hat often forms a fairly well defined zone at the contact of the coarser peg-atite and the enclosing schist; tourmaline usually is present.

Local Shippers

Mines that ship or have shipped feldspar to the Schundler mill and nearby ikes that are prospects and therefore potential shippers are described on the pages immediately following. Figure 2 shows the sites of these properties.

Smith Mine

No. 1 on figure 2. Date of inspection: August 9, 1938.

7560

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Situation.- At the Smith ranch, 5 miles east of Pringle; about 18 miles southeast of Custer.

Ownership.- The F. E. Schundler Feldspar Co., Inc., owns and operates the property.

Geology.- The spar occurs in a nearly vertical pegmatite dike that strikes northwest. The dike lies between a quartzite hanging wall on the northeast side and a schist foot wall on the southwest side. The length of the pegmatite outcrop is known to be about 750 feet. The exposed width of pegmatite ranges from 30 feet at the southeast end to 80 feet at the northwest end. A feldspar dike within the pegmatite consists mainly of microcline and quartz. The spar is blocky and of good quality in the central part of th dike, but near the walls it contains too much tourmaline to be marketable. Quartz is abundant in relatively coarse segregations and is easily sorted.

Products.- Potash feldspar.

Operation.- In August 1938 the Smith dike was being mined in four cuts. The most northerly cut was called the upper mine. It had been operated for 18 months by 18 men working in 3 shifts. The dike had been mined in two 20-foot benches for a width of 40 feet, leaving about 20 feet of the spar on eac wall because of its high tourmaline content. The floor of the pit had been drilled with 20-foot holes 10 feet apart; good spar was reported for the entire length. Mining of the floor was to be delayed, however, pending removal of about 120 feet of ground between the upper mine and a lower mine; the two mines were then to be worked as a unit. In August 1938 the south end of the upper cut was being stripped. The face was drilled and blasted by the compan driller. Two sorters shoveled the broken rock and earth into 1-ton mine cars at which time some spar was sorted out. The sorters wore screen goggles on this work as a safety measure. The spar was trammed 200 feet and dumped into a 60-ton bin, while the waste was dumped just beyond the bin. Track with an 18-inch gage was laid with 12-pound rails.

The cut known as the lower mine is 150 feet long and about 15 feet wide; the greatest depth is 40 feet at the north end. The floor of the lower mine is 45 feet lower than the floor of the upper mine. The marketable feldspar i the lower mine is overlain by 10 to 15 feet of "capping." In August 1938 fou men were sorting out 5 tons of feldspar a day from material that averaged about 30 percent feldspar. The sorted feldspar was trammed in 3/4-ton cars a distance of 200 feet to a loading platform. The waste was dumped nearby.

At the Smith property miners received $4.50 a day and shovelers $4.00 a day. Sorting was done by the shovelers. The cost of mining spar is estimate at $2.50 to $3.00 a ton delivered at the Custer mill.

In August 1938 the company was mining feldspar in two small pits near the south end of the Smith dike. Two laborers worked in each pit; they sorte out spar that had been broken down by the company miner and wheeled the spar and waste from the pits in wheelbarrows. About 8 to 10 down holes 12 feet deep were drilled on the outcrop with a jackhammer, using air supplied by a

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rtable compressor. Two sticks of 40-percent-strength gelatin dynamite and ree sticks of a special 45-percent-strength dynamite were used in each le; the gelatin dynamite served as a primer. Shots were fired electrically th a blasting machine. A round broke about 100 tons of rock. As one laborer oveled the broken rock into a wheelbarrow the other laborer picked out the rge pieces of feldspar and threw them into another wheelbarrow. About 4 ns of feldspar was sorted out in a day and wheeled 75 feet to a loading atform; the waste was wheeled about 50 feet and dumped. The company truck uled the feldspar in 5-1/2-ton loads to the mill at Custer; the haul was out 18 miles.

Remarks.- In the Smith mine and on the dumps are thousands of tons of at would be a good quality of feldspar except for the presence of about 5 rcent tourmaline. Most of the tourmaline crystals are larger than 1/16 inch diameter. Many tons of this type of spar are also available at other properties. The development of an economical method for separating coarse tourmaline from feldspar is much desired by the industry, as it would greatly increase the amount of feldspar available.

adside Mine

No. 7 on figure 2. Date of inspection: August 10, 1938.

Situation.- About 7 miles south of Custer.

Ownership.- F. E. Schundler Feldspar Co., Inc.

Geology.- The spar occurs in three parallel pegmatite dikes in schist hat strike north and dip nearly vertically. The most westerly dike is the argest. It is about 1,500 feet long and 25 to 100 feet wide; the walls are ot well defined on the surface. In addition to the feldspar, there are considerable quartz, mica, and tourmaline.

Products.- Potash feldspar.

Operation.- The largest dike is being developed by two cuts near the enter of the claim. The cuts are about 15 feet wide, 25 feet long, and 15 eet deep at the face.

Remarks.- The mine was not shipping in July 1938. Tourmaline contamintes many tons of what otherwise would be good feldspar at this property.

ull Elk Mine

No. 9 on figure 2. Date of inspection: August 10, 1938.

Situation.- About 10 miles southeast of Custer.

Ownership.- F. E. Schundler Feldspar Co., Inc.

Geology.- A pegmatite dike occurs in schist, is about 2,200 feet long, trikes northwest, and dips steeply southwest. A "vein" of good-quality feldspar occurring in the pegmatite has been exposed on one side.

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Remarks.- The property is being held in reserve.

Phillip Mine

No. 18 on figure 2. Date of inspection: August 16, 1938.

Situation.- 6 miles south of Custer.

Ownership.- F. E. Schundler Feldspar Co., Inc.

Geology.- A vertical pegmatite dike occurs in schist, is about 200 fee long and 50 feet wide, and strikes northeasterly. A spar "dike" in the peg matite dips steeply to the northwest. It contains a good quality of feldsp and abundant quartz. Mica is present in relatively small amount. Along th walls of the spar "dike" is considerable tourmaline.

Products.- Potash feldspar.

Operation.- In August 1938, a miner and two helpers were extending the lower of two benches in a southwesterly direction. The cut was in 75 feet; it was 15 feet wide and 10 feet deep. An upper bench of the same width and 15 feet in height had been mined above the present cut. Good spar remained in the floor of the lower cut. The bench was drilled with a jackhammer, us compressed air supplied by a leased portable compressor. About half of the rock broken down was marketable feldspar. The three men sorted about 200 t of spar a month. It was loaded into a 3/4-ton mine car and trammed 200 fee to a 10-ton bin. About 2,000 tons of feldspar has been shipped from the pr erty.

Reed Mine

No. 2 on figure 2. Date of inspection: August 9, 1938.

Situation.- On the Sheppard ranch, 5 miles east of Pringle; about 1/2 mile north of the Smith mine.

Ownership.- Sheppard owns the property. In August 1938 he was mining o the east side of a ridge; O. Reed was leasing on the west side of the ridge.

Geology.- The ridge that was being mined was a pegmatite "blow-up," the central part of which was occupied by a feldspar "dike." The spar is of goo quality. Quartz and mica are abundant but are easily sorted out; some tourm line is present.

Operation.- In August 1938 the cut on the west side of the "dike," oper ated by Reed, was in 50 feet; it was about 10 feet wide and ranged in height from a foot or so at the entrance to 20 feet at the face. The face was brok down in two benches. Holes were drilled by the company driller. A man and two boys sorted out about 5 tons of feldspar a day. It was forked into a wheelbarrow and trammed 100 feet to a 25-ton loading bin. The waste was dum alongside the bin.

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Mining on the east side of the ridge was done in a manner similar to at just described. The pit was 30 feet long, 15 feet wide, and 20 feet ep. Work was intermittent and was carried on as a side line to farming.

t Shot Lode

No. 3 on figure 2. Date of inspection: August 9, 1938.

Situation.- About 6 miles southeast of Custer; 1 mile west of Mount olidge in sec. 34, T. 3 S., R. 5 E.

Owners.- Thelan and E. A. Staudy own and operate the property.

Geology.- A nearly vertical pegmatite dike about 50 feet wide strikes rtheast. In August 1938 the inside 30 feet of the dike was mainly feldspar f good quality. There were occasional bunches of quartz and some mica and urmaline; all the waste minerals were easily sorted from the feldspar.

Operation.- A crosscut trench 50 feet long and 10 feet wide entered a it, which was 50 feet long, 30 feet wide, and 30 feet deep. The operating rce was limited to the two owners. The face was advanced in two 15-foot enches. Holes were drilled by a jackhammer; detachable bits were used. Air t a pressure of 100 pounds per square inch was supplied through a 3/4-inch ipe line by a portable compressor, which was belt-driven from a gasoline en- ine. The broken rock was sorted at the face, and the feldspar and waste were hoveled into separate 1-ton mine cars. The feldspar was trammed 200 feet to 1 25-ton loading bin; the waste was dumped near the bin.

eck Lode

No. 4 on figure 2. Date of inspection: August 9, 1938.

Situation.- Just north of Tinsley's mine; in sec. 34, T. 3 S., R. 5 E.

Ownership.- Kerf Beck owns and operates the property.

Geology.- A pegmatite intrusion trends northeast on the property. The orthwest wall of the intrusive appears to be quartzite and the southeast wall schist. The boundary of the pegmatite is not clearly marked on the surface. The feldspar in the center of the pegmatite intrusion was of good quality. Some quartz and mica were present; a pocket of beryl had been found.

Operation.- Beck works his mine alone. In August 1938 his pit was about 75 feet long, 20 feet wide, and 20 feet deep. His ground was drilled ahead of the face with 10-foot holes 5 feet apart. The rock broken in the face was about half feldspar. Beck sorted out 5 tons of feldspar a day and trammed it 150 feet in a 1-ton mine car to a loading platform. The waste was trammed about 100 feet and dumped.

Tinsley Mine

No. 5 on figure 2. Date of inspection: August 9, 1938.

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Situation.- About 100 yards north of the Hot Shot lode; a little south of the Beck lode; in sec. 34, T. 3 S., R. 5 E.

Geology.- A nearly vertical pegmatite dike in schist strikes east and west. Feldspar of good quality occupies the central part of the dike. Some beryl is present. Quartz and mica are the principal waste minerals.

Operation.- Entry to a pit is through a narrow crosscut trench 50 feet long. The pit is 100 feet long, 30 feet wide, and 30 feet deep at the face. The rock was broken in a series of 10-foot cuts. Two partners and two hired men sorted out the feldspar, which averaged about one-half of the tonnage broken. The feldspar was trammed about 175 feet in a 1-ton mine car and dumped into a 20-ton bin. The waste was dumped just east of the bin. Air for drilling was supplied by a portable compressor; conventional bits were used.

The miners hauled the feldspar by truck to the grinding mill of the Consolidated Feldspar Corporation at Keystone. They received $3.50 per ton of feldspar delivered.

In addition to the feldspar, 3 tons of mica and 1 ton of beryl had been hand-sorted.

Lookout Mine

No. 8 on figure 2. Date of inspection: August 10, 1938.

Situation.- About 2-1/2 miles northwest of Pringle.

Ownership.- Carroll Creek Mining Co.

Geology.- An irregular pegmatite body in schist is on the property; the walls are not well defined on the surface. The feldspar is a deep pink and is about 8 feet wide; it trends northwest and dips 60° NE. A little quartz and mica are present.

Products.- Potash feldspar. About 700 pounds of beryl and 5 pounds of columbite have been sorted out.

Operation.- A cut 8 feet wide follows the spar "dike" for about 20 feet. The depth of the cut ranges from 6 feet at the start to 20 feet at the face. In August 1938, two men and a boy were breaking down about 14 tons of rock a day, from which they sorted out 7 tons of spar. Drilling was done with a jackhammer supplied with air by a portable compressor. The gasoline consumption of the compressor averaged 5 gallons per day. Four 7-foot vertical hole were drilled and shot per day - two in the morning and two in the afternoon. About five sticks of 45-percent-strength dynamite were used in each hole. T sorted spar was trammed 100 feet in a wheelbarrow to a 10-ton loading bin. The F. E. Schundler Corporation truck hauled it to the mill at Custer.

Dakota Feldspar Mine

No. 10 on figure 2. Date of inspection: August 10, 1938.

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Situation.- About 10 miles south of Custer.

Ownership.- Lewis Collingwood, Reed, and others.

Geology.- A pegmatite dike in quartzite strikes easterly. The north all is vertical; the south wall dips 45° N. There is a prolific development of mica in the pegmatite along the north wall. A vertical feldspar dike lies next to the mica zone. In addition to feldspar and mica, quartz and some tourmaline are present in the pegmatite.

Products.- Mica (formerly) and potash feldspar (recently).

Operation.- The mica zone along the north wall of the dike was mined about 30 years ago. A crosscut adit was first driven 100 feet in a northerly direction to intersect the mica. From the end of the adit a 6- by 6-foot raise was driven vertically 90 feet to the surface; the top was then funneled out to form a glory hole. The mica zone, 8 feet wide and 100 feet long, was removed, leaving a shell of pegmatite about 5 feet thick between the excavation and the quartzite contact. The mica was sorted at a chute in the bottom of the raise. The mica zone was mined to a depth of 50 feet.

The present owners mined a dike of feldspar about 10 feet wide that formed the south wall of the old mica cut. The spar was then followed westerly for 200 feet with a cut 15 feet wide and 40 feet deep. Clean spar was sorted and trammed to the chute in 3/4-ton cars. The waste was retained temporarily behind a bulkhead, from which it was run into the chute and trammed at convenient times. About 10,000 tons of spar have been taken from the property.

Remarks.- In August 1938 about 20 tons of mica was stored in a 100-ton bin.

Beryl Lode

No. 11 on figure 2. Date of inspection: August 11, 1938.

Situation.- In the northeast corner of sec. 26, T. 2 S., R. 6 E., about 17 miles by road northeast of Custer.

Ownership.- Jessie Harris.

Geology.- A pegmatite dike in schist strikes northwest and dips southwest. A feldspar "dike" in the pegmatite consists mainly of good-quality pink spar. Other minerals present are quartz and mica.

Products.- The south end of the property was being developed for potash feldspar. Several tons of beryl had been mined from a cut on the north end.

Operation.- A cut 15 to 20 feet wide and 25 feet high at the face followed the spar dike for about 25 feet. Vertical holes 10 feet deep were drilled with a jackhammer, using 3/4-inch hollow hexagonal hand-sharpened steel. Each hole had about 3 feet of burden, was loaded with 12 sticks of 45-percent-strength dynamite, and was fired by means of a fuse and blasting cap. Air for

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drilling was supplied by a portable two-stage compressor rated at 250 cubic feet of free air per minute.

About half of the rock broken was sorted out as spar. It was loaded in a 3/4-ton mine car and trammed about 100 feet to a chute that delivered it t a bin. No shipment had been made from the bin.

J. A. Johnson Mine

No. 12 on figure 2. Date of inspection: August 11, 1938.

Situation.- In the northeast corner of sec. 22, T. 2 S., R. 6 E.

Ownership.- J. A. Johnson.

Geology.- A series of pegmatite dikes striking easterly.

Products.- Potash feldspar.

Operation.- Mining was done at two dikes. At the upper (more southerly dike a cut 30 feet wide was in about 30 feet; the face was 20 feet high. Dri ing and blasting were done by the F. E. Schundler Co. The rock broken down was sorted by the owner and a helper. About 36 percent of it was good-quali blue spar. It was loaded into a 1-ton or a 1/2-ton mine car and trammed abo 50 feet to a 10-ton bin. Waste was dumped near by. Two men could sort out tons of spar in a day.

At the lower (more northerly) dike a cut had been made into the face of a cliff. The cut was in 20 feet for the full height of the cliff, 60 feet. The lower half of the cut was 40 feet wide, the upper half 60 feet wide. A tunnel for exploration had been driven 80 feet from the center of the face. The face of the cliff was drilled from a sling suspended over the edge. Abou a third of the rock broken was cobbed for spar and trammed 150 feet in 1-ton mine cars to a 90-ton bin. Two men sorted about 6 tons a day on contract at $1.25 per ton.

High Land Spar Lode

No. 13 on figure 2. Date of inspection: August 12, 1938.

Situation.- Near the north boundary of sec. 20, T. 2 S., R. 5 E., about 2 miles north of Sylvan Lake, on the east side of Sunday Gulch.

Ownership.- Francis Michaud and W. W. Wright.

Geology.- The lode is one of a series of northwesterly striking pegmatit dikes just west of Harney Peak. The dike, which is nearly vertical, can be traced for about 2,700 feet on the surface. The spar "dike" within the pegma tite is 15 to 20 feet wide. It is composed mainly of white potash feldspar with abundant quartz and sparse mica. A little tourmaline is present but not much of it is in the spar. Lithiophilite and purpurite occur in small patche

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Remarks.- Mining awaits construction of a road into the property.

:a King Mine

No. 15 on figure 2. Date of inspection: August 13, 1938.

Situation.- On French Creek about 5-1/2 miles southeast of Custer.

Ownership.- Robert Davis.

Geology.- A nearly vertical pegmatite dike about 30 feet wide strikes rthwesterly through schist. About one-third of the dike is potash feldspar. quartz vein 2 feet wide cuts across the face of the pegmatite; additional artz is present in scattered bunches. Very little tourmaline is present. ne coarse biotite occurs near the southeast end of the dike. There is some llimanite in the schist near the southwest wall of the dike.

Products.- Mica (formerly) and feldspar.

Operation.- The property formerly was worked for mica along the northeast all of the dike. In August 1938 the dike was being developed for feldspar in uree places. Work was intermittent. About 25 tons of spar had been hand-orted and put in a bin.

ylvanite Lode

No. 16 on figure 2. Date of inspection: August 13, 1938.

Situation.- About 3 miles northeast of Custer.

Ownership.- Robert Davis.

Remarks.- A pegmatite dike containing feldspar, quartz, considerable tourmaline, and very little mica was exposed in a small prospect opening.

Come Along Lode

No. 17 on figure 2. Date of inspection: August 13, 1938.

Situation.- About 2-1/2 miles northeast of Custer, just northwest of the Gaudlin homestead.

Ownership.- Robert Davis.

Geology.- The lode is a pegmatite dike that strikes northwesterly and dips steeply to the southwest. A prospect opening shows some potash feldspar of good quality. Quartz occurs in bunches with some mica. There is no tourmaline.

Remarks.- The Come Along lode location includes the old Flora tin mine. The mine shaft is about 40 feet deep and is at the west end of a 300-foot cut

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that follows the footwall of a pegmatite dike. Cassiterite was found in the dump material from the cut.

Harball's Mine

No. 19 on figure 2. Date of inspection: August 16, 1938.

Situation.- About 10-1/2 miles southeast of Custer.

Ownership.- C. W. McKay and Chas. Harball. The property embraces the Happy No. 1 and No. 2 lode locations.

Geology.- A series of steeply dipping pegmatite dikes with northwesterly strike occurs in schist and quartzite. The walls of the dikes and their many spurs are not well defined. The pegmatite contains abundant feldspar, quartz and mica and very little tourmaline. A development cut whose face was 10 feet wide and 20 feet high was 15 feet in length.

McKay No. 1 Lode

No. 20 on figure 2. Date of inspection: August 16, 1938.

Situation.- About 12 miles southeast of Custer.

Ownership.- C. W. McKay and Chas. Harball.

Remarks.- A pegmatite "blow-up" in quartzite was being explored for feld spar possibilities. No spar had been sorted out for shipment.

Conlon Mine

No. 21 on figure 2. Date of inspection: August 17, 1938.

Situation.- 1-1/2 miles east of Pringle.

Ownership.- Joe Conloh.

Geology.- A poorly outlined pegmatite dike in schist strikes east. A spar "dike" within the pegmatite contains a good quality of feldspar, abundan quartz, and relatively little mica. The spar contains no tourmaline.

Product.- Potash feldspar.

Operation.- The pegmatite dike is on a cattle ranch that employs two men regularly, but when the men are not needed for routine ranch duty they are pa $1 a day additional to mine feldspar. Mining is therefore intermittent, de- pending largely on the weather. A cut 25 feet long was made through the schi to reach the spar "dike," and then turned to follow the spar. The cut in the spar was about 15 feet long and 10 feet wide; the face was about 12 feet high Drilling was done by the F. E. Schundler Feldspar Co., to whom shipments were made. The operators did their own blasting; fuse and blasting caps were used

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feldspar was sorted from the broken rock and loaded into a 1-ton mine , which was trammed about 75 feet to a 15-ton bin. About 100 tons of spar shipped in June 1938, 15 tons in July, and none in August (up to August 17).

d Mine

No. 22 on figure 2. Date of inspection: August 17, 1938.

Situation.- 1/4 mile south of the Conlon mine (see p. 46); about 1-3/4 les southeast of Pringle.

Ownership.- Annie M. Wood and Myrtle Conlon.

Geology.- A pegmatite dike striking northerly outcrops in an area of hist, quartzite, and granite. The feldspar is almost free from tourmaline.

Product.- Potash feldspar.

Operation.- Work has been done in the pegmatite outcrop at four places, t virtually all the spar produced was mined from the most southerly pit. o benches, each 20 feet high, had been advanced in a cut 15 feet wide. The wer bench was 50 feet in length; the upper one had previously been mined to point 40 feet beyond. A spur was followed 15 feet easterly from a point on e upper bench. Spar sorted from the rock that was broken on the lower bench s loaded into a 1-ton mine car and trammed 75 feet to a 20-ton bin. In gust 1938 operations were temporarily at a standstill, the borrowed track aving been returned to the owner. Approximately 1,000 tons of feldspar had en produced at the property.

gh Climb Mine

No. 23 on figure 2. Date of inspection: August 18, 1938.

Situation.- About 7-1/2 miles north of Custer.

Ownership.- John Wells.

Geology.- A northerly striking pegmatite dike containing inclusions of he schist wall rock is over 500 feet long and 100 feet wide. A spur from the ain dike strikes westerly. Quartz is more abundant than feldspar. Other inerals that occur in the dike are mica, amblygonite, beryl, soda spar, gray epidolite, and columbite.

Products.- Mica, amblygonite, beryl, spar. In August 1938 the High Climb as the only property in the district shipping amblygonite.

Operations.- Two men have been working on the property continuously for years. A cut 20 feet wide has been driven 75 feet in the dike; the face is 0 feet high. Drilling was done with a jackhammer. Detachable bits, which ost 30 to 38 cents each, were reground at the property. Compressed air for rilling was supplied at a pressure of 80 pounds per square inch by a 6- by -inch compressor driven by a Studebaker automobile engine. The minerals

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sorted out of the rock broken were loaded into a 1-ton mine car and trammed about 100 feet out of the cut, where they were loaded directly into trucks.

Two small cuts have been made in the westerly spur of the main dike. Spar, quartz, mica, and some amblygonite were exposed.

Shamrock No. 1 Lode

No. 25 on figure 2. Date of inspection: August 18, 1938.

Situation.- 1-1/2 miles east of Custer.

Ownership.- Mr. Mortenson.

Geology.- A vertical pegmatite dike in granite strikes north. The comm dike minerals are accompanied by spodumene and amblygonite.

Products.- Potash feldspar.

Operation.- Mining was begun at the north end of the dike; about 15 ton of feldspar had been shipped.

Triangle A Lode

No. 26 on figure 2. Date of inspection: August 18, 1938.

Situation.- 7 miles southeast of Custer.

Geology.- A prominent pegmatite dike about 1,000 feet long strikes nort erly on the property; the dip is not definite. The feldspar is of good quali except for the presence of intergrown quartz. Probably over 3,000 tons of dike rock have been broken. No spar has been shipped.

Tillison's Mine

No. 27 on figure 2. Date of inspection: August 19, 1938.

Situation.- 4 miles east of Custer.

Geology.- The mine is in a pegmatite dike that strikes northeasterly. addition to feldspar, quartz, and mica, there is considerable lithiophilite. Tourmaline is abundant, but there is very little in the spar.

Products.- Potash feldspar and mica.

Operation.- In August 1938 work had been stopped, at least temporarily. Three men had been employed previously.

Number Nine Lode

No. 28 on figure 2. Date of inspection: August 19, 1938.

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Situation.- 1/4 mile southwest of Scott's rose quartz mine.

Ownership.- Lewis Collingwood.

Geology.- The lode is a pegmatite dike in schist and quartzite; it strikes northerly. A little spodumene occurs with the pegmatite minerals.

Products.- Potash feldspar; some mica and beryl.

Operations.- Three men worked intermittently. Feldspar was sorted from the rock broken in a cut. It was loaded into a 3/4-ton car and trammed 25 feet to a chute 150 feet long, which delivered it to the mine road. About 400 tons of spar have been shipped.

Red Rose No. 1 Lode

No. 29 on figure 2. Date of inspection: August 19, 1938.

Situation.- About 6-1/2 miles southeast of Custer.

Ownership.- F. S. Scott.

Geology.- The lode is a pegmatite dike striking northerly.

Operations.- In August 1938 Roy Yapp had just taken a lease on the property and was beginning to open the south end of the dike. Drilling was done with a jackhammer using steam from a 10-horsepower boiler at a pressure of 100 to 110 pounds per square inch. A 3/4-inch pipe 150 feet long conveyed the steam from the boiler to the drill.

Haselrodt Lode

No. 30 on figure 2. Date of inspection: August 19, 1938.

Situation.- About 7-1/2 miles southeast of Custer; 1/2 mile east of Scott's rose quartz mine; about 300 yards south of the old Haselrodt C. C. C. camp.

Ownership.- Lewis Collingwood, G. W. Coats, and Chas. Roland.

Geology.- The workings are in a pegmatite dike with somewhat indefinite walls that appears to strike easterly. Feldspar, quartz, a relatively small amount of mica, and considerable tourmaline are present.

Operations.- At the east end of the dike several faces have exposed feldspar of good quality. No shipments have been made.

Pink Lode

No. 31 on figure 2. Date of inspection: August 19, 1938.

Situation.- About 7 miles south of Custer.

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Ownership.- Lewis Collingwood and Bud Smith.

Geology.- The lode is a northerly striking pegmatite dike.

Operations.- Exploration work has exposed feldspar at four places.

Gira and Ainsley's Dike

No. 34 on figure 2. Date of inspection: August 22, 1938.

Situation.- 1-1/2 miles southeast of Oreville.

Ownership.- Gira & Ainsley.

Geology.- The pegmatite dike strikes northwesterly in schist. Feldspar predominates with subordinate quartz and mica. Tourmaline rarely is found.

Products.- Potash feldspar.

Operation.- In August 1938 four men were occupied intermittently in mining feldspar. A cut 10 feet wide has been driven 15 feet; the face was 20 feet high. A small compressor supplied air for drilling. The spar sorte out of the rock broken down was trammed about 25 feet in a 12-cubic-foot car to a loading chute. Probably 100 tons of better-than-average spar had been shipped.

Wilhelm Mine

No. 35 on figure 2. Date of inspection: August 22, 1938.

Situation.- About 6 miles northwest of Custer.

Ownership.- John Wilhelm.

Geology. A pegmatite dike strikes northerly in schist. A horse of schi in the dike terminated mining operations. In addition to the feldspar, smal quantities of beryl, columbite, and amblygonite were sorted out.

Products.- Potash feldspar.

Operation.- The property was worked under lease by the F. E. Schundler Feldspar Co. during 1936 and 1937. A cut 30 feet deep was first mined. Tha was followed by crosscutting the schist for 50 to 75 feet on a lower level and mining the spar in a cut that was 40 feet wide at the bottom and 50 feet wide at the top; the face was 75 feet high. The mine produced about 5,000 ton of feldspar.

Raver and Michaud Mine

No. 36 on figure 2. Date of inspection: August 23, 1938.

Situation.- 2 miles west of Custer on U. S. Highway No. 16.

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Ownership.- H. D. Raver.

Geology.- A pegmatite dike in schist strikes east and dips south at 45°. ıe outcrop is about 200 feet long. Some quartz occurred with the feldspar ıd also along the walls of the dike, where it was accompanied by mica and ıall amounts of tourmaline and beryl.

Products.- Potash feldspar.

Operation.- A cut 15 feet wide was first advanced horizontally for 25 eet, then down a 30° incline to a point about 20 feet lower than the entrance. rom that point the cut was driven upward on a gentle slope. Six-foot holes ere drilled with a jackhammer. Each hole was loaded with five sticks of 45- ercent-strength gelatin dynamite and fired by fuse and blasting cap. A ılkhead was built near the base of the slope to catch the rock broken at the ace. A chute had been constructed near the center of the bulkhead for load- ng the broken rock into a 3/4-ton self-dumping skip operating on the 30° in- line. The hoist was driven by an automobile engine equipped with a 5/8-inch ire rope. The skip was hoisted about 50 feet and dumped onto a 1/2-inch unched screen 4 feet long set at 45° to the horizontal. The oversize slid to a sorting platform, where the feldspar was hand-picked and thrown into a 5-ton in. Mica and beryl were also hand-sorted at this point. The waste was hoveled into another bin, where it joined the screen undersize. In August 1938 about half the rock broken was hand-sorted as feldspar. The sorted spar as trammed 150 feet in a 3/4-ton mine car to a 50-ton loading bin. The waste was dumped near by.

Compressed air for drilling was supplied at 80 pounds per square inch by a 9- by 13-inch compressor run by a tractor engine.

During the summer of 1938, Raver employed three men to assist him - a riller, a skip-loader, and a sorter; each man was paid 35 cents per hour. Raver spent most of his time sorting. The crew of four men averaged 8 tons of sorted feldspar per day during July 1938. The haulage rate to the F. E. Schundler Co. mill at Custer was 25 cents per ton.

Heidepriem and Cattles' Mine

No. 37 on figure 2. Date of inspection: August 23, 1938.

Situation.- 2 miles southwest of Custer.

Ownership.- Fred Heidepriem.

Geology.- A vertical pegmatite dike strikes easterly in schist. The ike is about 150 feet long and 25 feet wide. A spar "dike" contained feld- spar of good quality surrounded by a "casing" containing quartz, mica, and tourmaline. There were horses of schist on the surface beyond the face of the workings.

Products.- Potash feldspar.

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Operation.- A cut averaging 10 feet in width and 12 feet in height had followed the spar "dike" for about 50 feet. Drilling was done by the F. E. Schundler Feldspar Co.; a miner drilled the face, using a jackhammer operated by air from a portable compressor. Hand-forged bits were used. A round of 16 to 18 ten-foot vertical holes, comprising a day's drilling, was completed twice a month. In August 1938 two men were employed to blast the holes and hand-sort the spar. Almost two-thirds of the broken rock was shipped as feldspar. The two men sorted out 7 to 8 tons of spar in a day. It was loaded into a 1/2-ton mine car and trammed 200 feet on a light 18-inch-gage track to a 50-ton loading bin.

Remarks.- In August 1938 another dike on the property was being opened by Heidepriem's son and another boy. The minerals exposed were badly mixed.

Dilley's Mine

No. 38 on figure 2. Date of inspection: August 23, 1938.

Situation.- At Sanator siding.

Ownership.- Fred Fee.

Geology.- A pegmatite dike occurs in schist. The usual pegmatite minerals are badly mixed, and tourmaline is abundant.

Products.- Potash feldspar.

Operation.- The dike was mined under lease by Dilley for 2 or 3 months, during which time feldspar was shipped. The property was not operating in August 1938.

Seller's Mine

No. 39 on figure 2. Date of inspection: August 23, 1938.

Situation.- 8-1/2 miles south of Custer; 1 mile south of Beecher Rock.

Ownership.- Mrs. C. Seller.

Geology.- A vertical pegmatite dike in schist strikes northerly. The di is about 300 feet long and 50 feet wide. The feldspar is clear and free from quartz, mica, and tourmaline.

Products.- Potash feldspar.

Operations.- Near the north end of the pegmatite, a spar "dike" has been opened in two places. In August 1938 two men were employed who did their own drilling. A portable gasoline-driven compressor, with a capacity of 240 cubi feet of free air per minute, consumed 20 to 25 gallons of fuel per day. Air was compressed to 100 pounds per square inch. About three-quarters of the ro broken was shipped as feldspar. It was hand-sorted, wheeled about 15 feet in

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barrow, and dumped into a chute, from the bottom of which it was loaded into 1-ton mine car. It was then trammed 100 feet and dumped into another chute, ich delivered it to a 25-ton loading bin.

Remarks.- The property was not working at the time of the visit.

ntain Rose Mine

No. 40 on figure 2. Date of inspection: August 24, 1938.

Situation.- 3/4 mile north of Pringle.

Ownership.- L. D. Pitts.

Geology.- A pegmatite dike in schist strikes northwest. In addition to e usual pegmatite minerals, which are somewhat mixed, considerable tourmaline d some beryl are present.

Products.- Pink potash feldspar; mica (formerly); some beryl.

Operations.- Mining has been done intermittently by lessees. Pitts drills e holes for the lessees and supplies the dynamite. He pays 60 cents per ton r feldspar in the bin. Drilling is done with a jackhammer, using air fur-ished by a small portable compressor.

The dike has been mined in an irregular cut 100 feet long. The width of he cut which ranges from 5 to 20 feet, averages 10 feet. The height ranges rom 6 to 30 feet. The rock broken is sorted and the spar is wheeled in a arrow about 100 feet beyond the mouth of the cut to a 25-ton bin. Waste is mped nearby. Possibly 400 to 500 tons of spar have been shipped.

da Spar Mine

No. 41 on figure 2. Date of inspection: August 24, 1938.

Situation.- 5 miles north of Pringle; 1/4 mile east of Highway U. S. 85.

Ownership.- L. D. Pitts.

Geology.- A vertical pegmatite dike 6 to 8 feet wide strikes northerly n schist.

Products.- Soda spar; some beryl.

Operations.- A cut about 10 feet deep was driven southerly for 25 feet. he cut was 5 feet wide except for the last 6 feet of length, which was 15 feet ide. The spar was hand-sorted and wheeled to a 10-ton bin 10 feet beyond the outh of the cut. Nothing had been shipped.

A cut 15 feet long, 5 feet wide, and 10 feet high had been made 500 feet outh of the main cut. In addition to the usual pegmatite minerals, some beryl was present; about 25 pounds had been sorted out.

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Mayo Lode

No. 42 on figure 2. Date of inspection: August 24, 1938.

Situation.- 1-1/2 miles northwest of Mayo station.

Ownership.- H. E. Brown.

Geology.- A series of pegmatite dikes strike northerly in schist. Feldspar, quartz, and mica are mixed; tourmaline is present in bunches.

Products.- Potash feldspar.

Operation.- In August 1938 the property was being worked under lease by Tom McConnell and Bert Ray. The royalty was 10 percent. A cut 6 feet wide an 10 feet high had been driven northerly for 30 feet in one of the dikes. Work was intermittent. Air for drilling was supplied by a small portable compresso owned by the lessees. At the beginning of operations about half of the rock broken was feldspar; later, only 25 percent could be sorted out. It was wheel about 50 feet and dumped on a loading platform. About 14 tons of feldspar had been shipped to Custer. A little mica, beryl, and tantalite had also been sol locally.

Virginia Dike

No. 43 on figure 2. Date of inspection: August 25, 1938.

Situation.- In school sec. 14 T. 4 S., R. 5 E., 1/2 mile southeast of Winter's saw mill.

Ownership.- F. H. Keith.

Geology.- The pegmatite intrusive is a "knob" in quartzite and schist.

Operation.- A 2-foot thickness of overburden has been removed with a bulldozer from an area 50 feet by 150 feet, preparatory to mining the knob from the south end with a power shovel. No excavation has been made in the pegmatite.

Big Bull Lode

No. 44 on figure 2. Date of inspection: September 15, 1938.

Situation.- 7 miles south of Custer on old Sidney Trail, 1/8 mile north of U. S. Highway No. 85-A.

Ownership.- Squier Gamber.

Geology.- The dike is a pegmatite "blow-up." Ribbon quartz runs through the feldspar, which is iron-stained; some tourmaline is present.

Products.- Potash feldspar.

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Operation.- A cut 15 feet wide and 25 feet high has been driven 25 feet to the pegmatite. The sorted spar was wheeled 50 feet in a barrow to a 10-n bin. About 25 tons of feldspar was shipped to the Custer mill.

In September 1938 the property was leased by Fred Wheeler and W. W. Jolley. was not being worked.

Hidden Treasure Lode

No. 45 on figure 2. Date of inspection: September 15, 1938.

Situation.- 4 miles east of Pringle on the south side of Bowman Draw; 1 le east of United States Highway No. 85-A.

Ownership.- Squier Gamber.

Geology.- A pegmatite dike strikes easterly.

Products.- Potash feldspar.

Operation.- A cut 8 feet wide and 18 feet high has been driven 15 feet nto the west end of the dike. The sorted spar was wheeled 50 feet to a 10-n loading bin. During the summer of 1938 about 40 tons were shipped.

Exploration work had been begun on the east end of the dike, but was sus-ended without definite results.

The property is leased by Fred Wheeler and W. W. Jolley.

Hi-High Lode

No. 46 on figure 2. Date of inspection: September 15, 1938.

Situation.- 1/4 mile east of Hidden Treasure lode (see p. 55).

Ownership.- Squier Gamber and W. E. Burr.

Geology.- A pegmatite dike strikes northerly. A round of holes was blasted, xposing blocky segregations of feldspar, quartz, and mica. Considerable tour-aline is present. The property is leased by Fred Wheeler and W. W. Jolley.

Gambler Lode

No. 47 on figure 2. Date of inspection: September 16, 1938.

Situation.- 3 miles southeast of Custer.

Ownership.- Cleo Worman and C. E. Donnelly.

Geology.- A pegmatite dike strikes northerly in schist and quartzite. The feldspar is of good quality, containing very little quartz and virtually no tourmaline.

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Products.- Potash feldspar; some mica.

Operation.- A cut 10 feet wide and 20 feet long has been made; the face is 10 feet high. The sorted feldspar is wheeled 40 feet to the top of a thr rail gravity tramway 200 feet long. Wooden cars on the tramway deliver the spar to a loading bin. About 100 tons of feldspar has been shipped. About pounds of mica, hand-sorted along the walls of the dike, was sacked on the d

Wayside Lode

No. 48 on figure 2. Date of inspection: September 16, 1938.

Situation.- 4 miles southeast of Custer; 1 mile east of the Rambler lod

Ownership.- Cleo Worman and C. E. Donnelly.

Geology.- A pegmatite intrusion is traversed by a series of spar "dikes" that strike southerly. Dark feldspar with ribbon quartz and some tourmaline has been exposed.

Products.- Dark potash feldspar.

Operation.- The spar "dikes" have been explored by four small cuts. The largest cut is 25 feet long and 8 feet wide; the face is 10 feet high. About 30 tons of feldspar have been shipped.

Sonny Boy Lode

No. 49 on figure 2. Date of inspection: September 16, 1938.

Situation.- The Sonny Boy lode adjoins the Wayside lode on the west.

Ownership.- Henry Shindelbower and Lloyd Hampton.

Geology.- An irregular body of pegmatite shows a segregation of feldspar that was being explored by drilling.

Roaring Lion Lode

No. 50 on figure 2. Date of inspection: September 16, 1938.

Situation.- About 6 miles southeast of Keystone; 1.2 miles northwest of Spokane.

Ownership.- Friend Robertson.

Geology.- A spar "dike" strikes northerly in granite. In addition to potash feldspar, the "dike" contains segregations of mica, soda spar, spodume amblygonite, beryl, and tantalite.

Products.- Mainly potash feldspar; small amounts of the other minerals mentioned above.

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Operation.- The property is leased by W. A. Carson. A cut 15 feet wide s driven 75 feet into the dike; the face was 30 feet high. The rock broken s about 50 percent feldspar. It was sorted out and trammed 100 feet in a ton mine car to a loading chute. The waste was dumped near by. During the mmer of 1938 two men shipped about 100 tons of feldspar per month. Nine tons nica had been sold to John Wells at Custer. The following amounts of other nerals had been hand-sorted but not yet sold: Spodumene, 3 tons; beryl, 3 ns; amblygonite, 18 tons; tantalite, 100 pounds.

uise Lode

No. 51 on figure 2. Date of inspection: September 17, 1938.

Situation.- On the north side of Tenderfoot Gulch, 3/4 mile southwest of eville; 7.2 miles north of Custer.

Ownership.- C. A. Hunter and C. A. Trautman.

Geology.- A pegmatite dike about 800 feet long, in schist, strikes northrly and dips 70° W. Spodumene logs occur in quartz; feldspar and a little ourmaline are present.

Products.- Spodumene.

Operation.- The dike has been mined intermittently for 3 years. A cut 5 to 20 feet wide follows the hanging wall of the dike for 150 feet; it is 40 eet high at the face. During the summer of 1938, two men were working in the it most of the time. Vertical holes with a maximum depth of 12 feet were rilled with a jackhammer, using detachable bits on 7/8-inch hollow hexagonal teel. New bits with a 2-1/8-inch gage could be reground two or three times. rom 15 to 20 sticks of 40-percent-strength gelatin dynamite were normally sed in each hole. Shots were fired by fuse and blasting cap. Air for drilling as supplied at a pressure of 85 pounds per square inch by a portable gasolinedriven compressor rated at 120 cubic feet of free air per minute. One hundred eet of 3/4-inch pipe connected the compressor to the drill hose. About 15 to 0 percent of the rock was hand-sorted as spodumene and thrown into 5-gallon ans, which were loaded on top of a 3/4-ton carload of waste and trammed 150 eet to the top of a cableway. The track rails were 12-pound; the gage, 18nch. The cans of spodumene were dumped into a 1-ton wooden tram car on the ableway. The track cable is an old 1-inch oil-well drilling line. The tram ar is lowered by a hoist driven by a Ford model-A engine through a distance of 600 feet on the hillside to a 40-ton loading bin; the traction line is 3/8-inch.

Before September 17, 1938, 98 tons of spodumene had been mined; 30 tons were in the loading bin. The spodumene was shipped to the Foote Mineral Co., Philadelphia, Pa. The last car shipped assayed 6.43 percent lithia (Li_2O); the others assayed 6.42, 5.40, and 6.00 percent lithia. The Foote Mineral Co. pays $18 per ton, f.o.b. Custer, for spodumene containing 5 percent lithia. The last car shipped brought over $19 per ton. One of the shipments was mined from a pit about 200 feet north of the main cut.

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Remarks.- Cassiterite occurs in a small cut near the south end of the Louise claim.

Maryland Lode (formerly Olds Lode)

No. 52 on figure 2. Date of inspection: September 19, 1938.

Situation.- 1/2 mile east of Camp Remington; about 10 miles northeast o Custer.

Ownership.- James Shea.

Geology.- A series of pegmatite dikes occur in granite.

Operation.- In the north end of the claim a shallow cut has followed a mica zone for about 100 feet in a northerly direction. Mica formerly had be shipped from the cut. The best feldspar showing is in a dike that strikes easterly in the central part of the claim. A cut follows the spar for about 30 feet. In the southern part of the claim two cuts explored spar "dikes" that strike easterly. One cut is in about 25 feet; the other, about 50 feet The usual pegmatite minerals are present in both cuts, but no mineral is suf ficiently segregated to permit economical sorting.

Fannie McAdam Ranch

No. 53 on figure 2. Date of inspection: September 19, 1938.

Situation.- 7 miles southeast of Pringle, on United States Highway No. 85-A, in the S1/2S1/2 secs. 27 and 28, T. 5 S., R. 5 E.

Ownership.- Fannie McAdam.

Geology.- Several parallel vertical pegmatite dikes in granite and quar zite strike northerly. The dikes occupy an area extending about 2 miles eas and west. Some of the outcrops are over 1,000 feet in length; the greatest width is about 75 feet. Both pink and blue feldspar are found. Very little tourmaline is present.

Tip Top Lode

No. 54 on figure 2. Date of inspection: September 20, 1938.

Situation.- 5 miles southwest of Custer; 1 mile northeast of the New Yo mica mine.

Ownership.- W. A. Nevin.

Geology.- A pegmatite dike strikes easterly in schist. Very little tou maline is associated with the feldspar. Lithiophilite occurs in a small str

Products.- Potash feldspar; some mica.

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Operation.- The property is leased to Pierce Byers. A narrow cut was iven 25 feet into the north side of the dike, then turned west and driven feet wide 25 feet along the strike; the cut is 6 to 20 feet high. In Sep- mber 1938 drilling was done every 15 days by the F. E. Schundler Feldspar . The sorted spar, amounting to about 30 percent of the broken rock, was rown into a 1-ton wooden buggy equipped with Ford automobile wheels. The ste was loaded into another buggy. The buggies were trammed 50 feet beyond e mouth of the cut to the loading bin or waste dump. Two men and a boy ipped about 150 tons of spar per month. They hauled it to the Custer mill their own truck. The dike has produced 1,000 to 1,500 tons of feldspar. out 300 pounds of mica have been hand-sorted and sacked.

e Point Lode

No. 56 on figure 2. Date of inspection: September 20, 1938.

Situation.- On the Lindstrum ranch, 4-1/2 miles southwest of Custer.

Ownership.- Chas. Rosebury.

Geology.- A pegmatite dike in schist has a quartz "cap." In addition to e usual pegmatite minerals, some tourmaline and a little lithiophilite are resent. Exploration workings comprise three small cuts and a shaft 10 feet eep.

ster Mountain Lode

No. 57 on figure 2. Date of inspection: September 24, 1938.

Situation.- In Heidepriem Gulch, 2-1/2 miles southeast of Custer.

Ownership.- B. M. Dilley.

Geology.- A pegmatite intrusive of irregular outline contains blocky ldspar of good quality. Mica, beryl, and spodumene are also present.

Products.- Potash feldspar, mica, beryl, and spodumene.

Operation.- A main cut, sloping steeply downward from a level surface, was) to 20 feet in width, 100 feet in length, and ranged in depth from 10 feet the entrance to 35 feet at the face. The cut was filled in, except for the ast 25 feet, making a gentle haulage grade sloping down toward a bulkhead out 15 feet high, which held the fill back from the working pit. Spar sorted t of the rock blasted at the face was loaded into a wooden box in the pit. truck chassis with a hoisting derrick mounted on the front end was backed wn in the incline to the bulkhead. The wooden box of spar was hoisted and t on the chassis, thus becoming the truck body. The spar was then hauled t of the cut about 100 feet to a bin on the road. About half of the rock oken was hand-sorted as feldspar. In September 1938 a crew of 3 to 8 men s shipping about 20 tons of spar a day. Air for drilling with a jackhammer ing detachable bits was supplied by a portable compressor. Shots were fired

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with electric blasting caps or with fuse and caps. During the year ended July 1938 about 2,500 tons of feldspar was shipped to Custer. There were on hand 8 tons of mica, 5 tons of beryl, and 10 tons of spodumene.

In addition to the main cut, several others had been made and showed good spar.

Emma Hardesty Homestead

No. 80 on figure 2. Date of inspection: August 1, 1938.

Situation.- In sec. 36, T. 1 S., R. 5 E., B. H. M., on the Hill City-Keystone Highway about 8 miles east of Hill City and 4 miles northwest of Keystone.

Ownership.- Emma Hardesty.

Geology.- A pegmatite dike 30 feet wide in schist strikes a little east of north and dips 30° W. Mica and soda spar occur near the walls of the dike; quartz is most abundant through the center. Potash feldspar, amblygonite, beryl, columbite, and lepidolite also are present.

Operation.- A small cut had been made where the dike outcropped on a hillside. Mining was intermittent and was carried on only when it would not interfere with farming. Drilling was done by hand. Usually enough rock could be broken in a day to keep two men busy sorting for a week. Minerals hand-sorted at the face were shoveled into a 200-pound wooden sled, which was skidded about 100 feet down a 30° slope to a storage platform, from which trucks were loaded. The sled was operated by a hand winch. On August 1, 1938, 2 tons of soda spar, 4 tons of amblygonite, 5 tons of potash feldspar, 3 tons of beryl, and 3 tons of scrap mica were stored at the property.

Ross Dike (Highland Lode and Vein)

No. 81 on figure 2. Date of inspection: October 15, 1938.

Situation.- About 5-1/2 miles northwest of Custer.

Ownership.- New York Holding Association.

Geology.- A pegmatite dike in schist contains clear feldspar of good quality, subordinate segregations of quartz and mica, and a little tourmaline in the "casing".

Operation.- A cut 15 feet wide has been driven 25 feet; the face is 15 feet high. A man and his wife did the blasting and sorting; a miner with a portable compressor was hired to do the drilling. The sorted spar was wheeled 50 feet to a chute, which delivered it to a 25-ton bin. At the time of inspection the property was leased by John Ross. The royalty was 40 cents per ton of feldspar and 10 percent of the byproducts.

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elps Dike (Roosevelt Lode)

No. 82 on figure 2. Date of inspection: October 15, 1938.

Situation.- About 3-1/2 miles north of Custer.

Ownership.- J. D. Long and John C. Phelps.

Geology.- A pegmatite dike in granite, schist, and quartzite contains ldspar, quartz, a little mica, tourmaline, and lithiophilite.

Operation.- A cut 6 to 10 feet wide was driven 35 feet; the face was 20 et high. The spar was hand-sorted and wheeled 50 feet in a barrow to a 10- n bin. Air for drilling was supplied by a 4-cylinder automobile engine, o cylinders being used for power and the other two for compressing air.

e Burrow's Dike

No. 83 on figure 2. Date of inspection: October 15, 1938.

Situation.- About 2 miles south of the Tallent monument; 1/2 mile due uth of the Walsh ranch house.

Ownership.- Bud Landis.

Geology.- A pegmatite dike in schist and quartzite contains feldspar, artz, mica, and tourmaline; blocky but mixed.

Operation.- A cut 10 feet wide was driven 50 feet; the face was 20 feet igh. Drilling was done by the F. E. Schundler Feldspar Co. The sorted spar as wheeled 100 feet in a barrow to a loading chute. A smaller cut had been ade 50 feet east of the first cut. The property was idle when visited. It ad been leased by Lee Burrows; the royalty was 40 cents per ton.

. & M. Lode No. 5 (Howard Mine)

No. 84 on figure 2. Date of inspection: October 15, 1938.

Situation.- About 2 miles south of the Flynn Creek picnic grounds; 1-1/2 iles north of the Bull Elk lode.

Ownership.- E. E. Howard, P. E. Martin, and C. J. Young.

Geology.- A pegmatite dike in schist contains blocky feldspar with inter- ixed quartz, mica, and tourmaline.

Operation.- A cut 10 feet wide was driven 25 feet; the face was 15 feet igh. Drilling was done by the F. E. Schundler Feldspar Co. Two men sorted ut the spar, which was wheeled 40 feet in a barrow to a loading chute.

New Deal Lode

No. 86 on figure 2. Date of inspection: October 5, 1938.

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Situation.- In sec. 9, T. 3 S., R. 5 E., B. H. M.

Ownership.- Carl Roseberry.

Geology.- A pegmatite dike in schist contains feldspar of good quality, quartz, a little mica, and very little tourmaline.

Operation.- A cut 4 feet wide was driven 10 feet, then widened to 8 feet and driven 30 feet farther; the face was 15 feet high. About 150 tons of sort spar had been shipped to Custer.

E. L. Davis Mine (Old St. Louis Mica Mine)

No. 38 on figure 2. Date of inspection: September 26, 1938.

Situation.- On French Creek about 4 miles southeast of Custer.

Geology.- The pegmatite intrusive is a "blow-up" of irregular outline in schist. The outcrop is about 500 feet in diameter and extends over a vertica range of about 100 feet. The pegmatite contains an apparently good quality o feldspar with subordinate amounts of quartz, mica, and tourmaline.

Operation.- Feldspar had been mined in two pits. The larger pit was about 50 feet long and 50 feet wide; the face was about 35 feet high. The smaller pit was about half the size of the larger and about 50 feet east of i A track extended from both pits to a bin 50 feet west of the larger pit. In September 1938 three men were mining the west side of the smaller pit to connect with the larger one. They did their own drilling and blasting. The sorted spar was trammed to the bin in 1-ton mine cars. About 10 tons of spar was produced per day. Operations had been resumed about the middle of Septem ber 1938 after a long shut-down.

The old St. Louis mica mine had a shaft 90 feet deep. In September 1938 there was about 60 feet of water in the shaft. Plans have been made to pump the water and operate the mica mine.

Lone Pine Lode

No. 85 on figure 2. Date of inspection: October 15, 1938.

Situation.- In sec. 24, T. 5 S., R. 4 E., B. H. M.; about 1 mile southeast of Pringle.

Ownership.- G. W. McCoy.

Geology.- A pegmatite dike contains dark-blue and red feldspar, quartz, mica, and a little tourmaline.

Operation.- A cut 3 feet wide was driven 25 feet through a mixture of feldspar, mica, and Deadwood formation to intersect the dike. A pit 15 feet wide and 10 feet long was then opened; the face was 12 feet high. Drilling

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done by the F. E. Schundler Feldspar Co. Three men hand-sorted the spar, h was wheeled 40 feet in a barrow to a loading platform. The property was when visited.

ay Lode

No. 87 on figure 2. Date of inspection; October 3, 1938.

Situation.- About 4 miles west of Custer; it adjoins the Minnie May lode d, survey No. 1999) on the south.

Ownership.- I. W. Lanham and Dr. E. E. White.

Geology.- A pegmatite dike in granite and schist contains feldspar, of l quality but iron stained, quartz, mica, a little tourmaline, and some yl.

Operation.- A cut 10 feet wide and 10 feet high at the face was driven feet into the base of a knob 50 feet high. About 200 feet to the east and feet higher on the same knob, another cut was made 10 feet long and 6 feet e; the face was 8 feet high.

ependence Lode

No. 89 on figure 2. Date of inspection: October 3, 1938.

Situation.- Just south of Independence No. 1 lode, about 4 miles west of ter.

Ownership.- I. W. Lanham and Dr. E. E. White.

Geology.- A pegmatite dike in granite and schist contains feldspar, in- mixed with quartz, mica and tourmaline.

Operation.- A cut 6 feet wide was driven 5 feet; the face was 8 feet high.

dependence No. 1 Lode

No. 88 on figure 2. Date of inspection: October 3, 1938.

Situation.- 1 mile north of Friday lode at the southwest corner of the nie May lode (gold, survey No. 1999); about 4 miles west of Custer.

Ownership.- I. W. Lanham and Dr. E. E. White.

Geology.- A pegmatite dike in granite and schist contains feldspar, artz, mica, and tourmaline, mixed.

Operation.- A cut 8 feet wide was driven 10 feet; the face was 8 feet gh. Another cut, 200 feet southeast of the first cut, was 6 feet long and feet wide; the face was 10 feet high.

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Pot Lode

No. 90 on figure 2. Date of inspection: September 24, 1938.

Situation.- 10 miles southeast of Custer on Flynn Creek; in SW1/4SW1/4 sec. 21, T. 4 S., R. 5 E., B. H. M.

Ownership.- Scovel Johnson.

Geology.- A pegmatite dike in quartzite contains dark feldspar, quartz, mica, and tourmaline. The spar and the quartz are blocky.

Operation.- A cut 5 feet wide was driven 18 feet; the face was 20 feet high. From 10 to 15 tons of spar was shipped to Custer. The property was idle in September 1938.

Tut Lode

No. 91 on figure 2. Date of inspection: September 24, 1938.

Situation.- In NW1/4 sec. 29, T. 4 S., R. 5 E., B. H. M.

Ownership.- Scovel Johnson

Geology.- A pegmatite dike in quartzite and schist contains blocky feldspar, pink quartz, mica, and tourmaline.

Operation.- A main cut 6 feet wide was driven 60 feet; the face was 25 feet high. The spar was hand-sorted and wheeled about 50 feet beyond the mouth of the cut to a chute, which delivered it to a log bin.

About 75 feet south of the main cut a parallel cut 6 feet wide was drive 20 feet; the face was 15 feet high.

About 20 tons of spar was shipped from the main cut.

Little Spar Lode

No. 92 on figure 2. Date of inspection: September 27, 1938.

Situation.- Adjoins the Rives lode on the north; about 7 miles southeast of Custer.

Ownership.- Dave Virtue.

Geology.- A pegmatite dike in granite contains feldspar, quartz, mica, and relatively large crystals of tourmaline. The minerals are somewhat block but mixed.

Operation.- A cut 10 feet long was driven westerly to enter the dike, th was driven south 5 feet wide for 20 feet; the face was 6 feet high. About 20 tons of spar have been shipped.

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t Lode

No. 93 on figure 2. Date of inspection: September 24, 1938.

Situation.- About 10 miles southeast of Custer on the Flynn Creek-Wind ave road; in SE1/4 sec. 29, T. 4 S., R. 5 E., B. H. M.

Ownership.- W. F. Denean.

Geology.- A pegmatite dike in quartzite strikes northerly. It contains eldspar, quartz, mica, and tourmaline, and some beryl. Some of the spar is ntergrown with quartz.

Operation.- A cut 6 feet wide and 5 feet high at the face was driven 30 eet. The spar sorted out of the broken rock was wheeled 50 feet beyond the outh of the cut to a bin. About 30 tons of spar has been shipped. About 30 ounds of beryl has been sorted out. The property was idle in September 1938.

et Lode

No. 94 on figure 2. Date of inspection: September 24, 1938.

Situation.- Just east of the Bet lode; about 10 miles southeast of Custer.

Ownership.- W. F. Denean.

Geology.- A pegmatite dike in quartzite and schist strikes northerly. It contains some dark and some pink feldspar of good quality, quartz, mica, and tourmaline. Some beryl is present.

Operation.- A cut 6 feet wide and 15 feet high in the face has been driven 15 feet. About 200 pounds of beryl has been taken out. The property was idle in September 1938.

Porky Lode

No. 95 on figure 2. Date of inspection: September 23, 1938.

Situation.- About 6 miles southwest of Custer.

Ownership.- F. Michaud, P. Hibbard, and M. Heumphreus.

Geology.- A pegmatite dike in schist contains pink feldspar in large blocks, quartz, mica, tourmaline, and a little triphylite. Some of the spar is iron stained.

Products.- Potash feldspar.

Operation.- A cut 5 to 12 feet wide has been driven 40 feet; the face was about 25 feet high. The sorted spar was wheeled in a barrow about 75 feet to a storage platform. Four or five hundred tons of feldspar has been shipped. The property was idle in September 1938.

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Old Mike Mine

No. 96 on figure 2. Date of inspection: October 8, 1938.

Situation.- About 5-1/2 miles north of Custer.

Ownership.- Maywood Chemical Works, Maywood, N. J.

Geology.- A pegmatite dike in schist contains blocky feldspar, quartz, mica, and a little lithiophilite. Tourmaline is absent.

Operation.- Recent mining has been conducted on the walls of a cliff tha rises 40 feet above the workings of an old underground mica mine. The spar sorted out of the broken rock was trammed 50 to 75 feet in a 1/2-ton mine car to a loading chute. George Medill was in charge. The property was idle when visited.

New York Mica Mine

No. 33 on figure 2. Date of inspection: August 20, 1938.

Situation.- In Pleasant Valley; 7-1/2 miles southwest of Custer.

Ownership.- John Wells

Geology.- A pegmatite dike strikes northwesterly and dips about 45° SW. Mica is present in zones along both walls of the dike.

Products.- Mica.

Operation.- The property was worked about 50 years ago for mica. A shaf 300 feet deep was caved. A trommel with a 2-inch wire screen had been used t separate coarse from fine mica. The coarse mica was trimmed and barreled. The fine mica was ground to several sizes, which were barreled separately.

Remarks.- The property is regarded as a potential source of feldspar.

Scott's Rose Quartz Mine

No. 6 on figure 2. Date of inspection: August 9, 1938.

Situation.- T. 4 S., R. 5 E.; about 7 miles southeast of Custer.

Ownership.- Frank Scott.

Geology.- The mine is in a pegmatite dike whose walls are not well defined on the surface. The principal minerals are feldspar with mica and rose quartz.

Products.- Feldspar and rose quartz.

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Operation.- Drilling was done by hand. A plug-and-feather method was ;ed to preserve large blocks of rose quartz. Feldspar was sorted out.

Remarks.- This mine is the main producer of rose quartz in the Black .lls. In July 1938 the mine was idle. It was planned to develop the feld-;ar in the near future.

in Mountain Mine

No. 97 on figure 2. Date of inspection: July 30, 1938.

Situation.- About 7 miles west of Custer.

Ownership.- Maywood Chemical Works.

Geology.- A pegmatite dike in schist contains potash feldspar, spodumene, mblygonite, beryl, columbite, and pollucite.

Operation.- The mine has several hundred feet of underground workings. It is notable for the occurrence of pollucite, an ore of caesium, a carload of which was shipped in 1928. Spodumene has been the main product of the mine; some amblygonite and beryl were shipped.

Beecher Lode

No. 32 on figure 2. Dates of inspection: July 30 and August 19, 1938.

Situation.- About 5 miles northeast of Pringle.

Ownership.- John McGraw and Forrester.

Geology.- The following data on geology and operations were contributed by George Bland, who sold the property to the present owners. A pegmatite dike in schist strikes a little east of north and dips 60° W. It is exposed for a length of about 800 feet. The dike contains a wide variety of pegmatite minerals, including potash and soda feldspars, spodumene, quartz, mica, amblygonite, lepidolite, beryl, cassiterite, columbite, and triphylite. The minerals are segregated in zones to some extent. A foot-wall zone 25 feet wide contains quartz, soda spar, mica, amblygonite, and spodumene. Most of the amblygonite was along the west side of the zone. West of the foot-wall zone is a middle zone 30 to 35 feet wide of orthoclase feldspar. West of the middle zone is a hanging-wall zone 20 feet wide, which contains quartz, soda spar, and mica.

Operation.- Most of the mining has been confined to three main pits extending along the strike of the dike. Access to the pits is by short crosscut tunnels through the footwall schist. The amblygonite pit is the most northerly. It has a length of about 180 feet, an average width of about 30 feet, and a depth of 25 feet. Eight hundred tons of amblygonite and 3 tons of columbite were produced from the pit. A centrally situated pit, called the middle pit, is 100 feet long, 25 to 30 feet wide, and 40 feet deep. It contains the same minerals as the amblygonite pit and has produced 400 to 500 tons of amblygonite.

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The two pits mentioned are situated along the footwall of the dike. A third pit is 100 feet long, 30 feet wide, and 15 feet deep. It is in the central zone of the dike and is separated from the south end of the middle pit by a 15-foot pillar. The south pit has produced 10 tons of columbite and about 150 tons of spodumene.

Several exploratory crosscuts and drifts have been driven below the pits and westerly from the pits. About 150 feet south of the south pit a vertical shaft, which was sunk to a depth of 25 feet, exposed spodumene and lepidolite. Just north of the amblygonite pit, cassiterite is exposed in a small cut.

According to George Bland, the future of the property depends on the possibility of developing spodumene at depth. The property was idle in the summer of 1938.

The following production data were contributed by Lewis Collingwood, one of the former owners of the property. Prices are f.o.b. Custer, S. Dak.

Columbite.- Shipped 27 to 28 tons from 1927 to 1937, virtually all from the south end of the dike. The price received ranged from 30 to 80 cents per pound.

Amblygonite.- Shipped as follows:

Year	Tons	Shipped to:
1903	100	
1907	200	
1911	350	
1928	150	Maywood Chemical Works.
1929	200	Var-lac-oid Chemical Co.
1933-34	800	Foote Mineral Co., Inc.
1935	300	Foote and Var-lac-oid.
1936	180	Var-lac-oid.
1937	90	

Prices received for amblygonite ranged from $30 to $50 per ton; the average was about $45 per ton.

Beryl.- Sold 30 tons for $30 per ton. About 30 tons is stored at the property.

Mica.- Sold about 500 tons for $10 per ton. About 250 tons is stored.

Spodumene.- Sold 5 tons for $25 per ton.

Lepidolite.- None sold; many tons stored.

Triphylite.- Some stored.

Potash feldspar.- Some stored.

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Tom Mine

No. 14 on figure 2. Date of inspection: August 12, 1938.

Situation.- About 6 miles southwest of Custer.

Ownership.- F. Michaud, P. Hibbard, and M. Heumphreus.

Geology.- A nearly vertical pegmatite dike, which has several included ises of the schist wall rock, strikes northwesterly. Soda feldspar and pot- feldspar are abundant. Quartz, mica, and some tourmaline are present. e beryl and amblygonite have been sorted out.

Products.- Soda feldspar, probably mostly cleavelandite.

Operation.- In August 1938 work was done under lease by the Consolidated ldspar Co. of Keystone. The lessee paid a royalty of 50 cents per ton.

A cut 15 feet wide followed the spar for about 50 feet; the face was 30 et high. Approximately 30 percent of the rock broken down is soda spar con- ining about 10 percent Na_2O. It is sorted out at the face and trammed 100 et in a 3/4-ton mine car to a chute. Waste is dumped near by. The cost of ning a ton of soda spar is estimated to be $5 to $6. The cost of trucking Keystone, a distance of 30 miles, is $0.75 to $1 per ton. Most of the ound soda spar is shipped to East Liverpool, Ohio; the freight rate is $9.60 r ton. Some spar is shipped to Trenton, N. J. The value of the spar in ster, S. Dak., is $6 to $7 per ton.

Abingdon Sanitary Manufacturing Co.

ite Elephant Mine

No. 24 on figure 2.

The White Elephant feldspar mine is about 8 miles south of Custer, one arter mile east of the highway to Pringle. The mine is owned and operated the Abingdon Sanitary Manufacturing Co. of Abingdon, Ill.

The White Elephant pegmatite is an elliptical body with a northerly trend. e feldspar "dike" within the pegmatite strikes north and dips steeply west; t is about 500 feet long. The principal mineral in the "dike" is potash feld- par, probably microcline, which is blocky and of good quality. Considerable artz, some of it rose-tinted, and muscovite mica are present, especially ong the borders of the "dike." The spar is slightly iron-stained in places e to a content of over 0.03 percent iron. Black tourmaline is present in all segregations; usually it can be hand-sorted without difficulty. Oc- asional pockets of beryl have been found. An analysis of the feldspar shipped uring 1937 and 1938 is shown in table 11.

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TABLE 11.- Average analysis of Abingdon feldspar, 1937 and 1938

Ignition loss	0.225
Silica	66.74
Alumina	19.04
Calcium	Trace
Magnesium	Trace
Soda	3.22
Potassium	10.95
Iron	.063

The White Elephant dike has produced possibly 50,000 tons of feldspar since operations were begun in 1928. The average rate of production during 1937 was 500 tons per month. During 1938 monthly shipments averaged eight 40-ton cars; the maximum in 1 month was fifteen 40-ton cars.

In October 1938 work at the White Elephant mine was done under the direction of the mining contractor, who received $2.50 per ton of spar shipped. The contractor paid for labor and explosives. Labor consisted of one miner and truck driver at 60 cents per hour and three sorters and trammers at 50 cents per hour. The men worked 8 hours a day for 6 days a week. Late in October 1938 working hours were reduced to 44 hours per week.

The feldspar was mined by advancing the north end of a surface cut in the "dike." The cut was about 250 feet long, 30 to 80 feet wide, and 60 to 90 feet high. A miner drilled down-holes 10 feet deep across the face, descending in irregular benches from the top of the cut. Drilling was not continuous but rounds were drilled intermittently to supply the needs of the sorters. A small compressor just east of the cut supplied air for drilling at a pressure of 90 pounds per square inch. Drill steel was 7/8 inch; bits were hand formed. Only two 10-foot holes were shot at a time. The broken rock was sorted where it fell on the floor of the cut. Three sorters threw the quartz and mica into a 1-ton car and forked the feldspar into another. The ratio of feldspar to waste in the material blasted ranged from 1:3 to 3:1. The sorted spar was trammed about 100 feet on the floor of the pit, then about 150 feet across stulls over an excavation that resulted from the mining of the southern end of the "dike" from a lower level. The stulls are about 30 feet long and are supported at the center by 30-foot posts that rest on the footwall of the dike. The track gage is 24 inches. Just beyond the south end of the cut, the cars were hooked on the end of a 1/4-inch wire rope and lowered on a 6-percent incline for a distance of 200 feet. They were then dumped into a 700-ton bin. A counterweight pulled the empty car back. The bottom part of the bin was in the nature of an ore pocket; the chute gate was underground at the end of a 75-foot adit. The spar was trammed by hand in a 1-ton wooden car from the gate of the 700-ton bin to a 25-ton loading bin, where it was dumped over an 8- by 3-1/2-foot grizzly with 3/4-inch spaces. The oversize was loaded into company 2-ton trucks, which hauled a 4-1/2-ton load 3/8 mile to the railroad siding 4 miles north of Pringle. The fines were stock-piled or used on the company road; inasmuch as the material had previously been forked, there was very little undersize.

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Waste sorted out of the spar at the face of the cut was trammed 125 feet :d dumped into an old excavation, from the bottom of which it ran down a 70° :clined raise for 120 feet to a crosscut adit. It was then hand-trammed 400 :et to the portal of the adit and dumped.

:wnsite Lode

No. 98 on figure 2. Date of inspection: October 10, 1938.

Situation.- About 1 mile directly southeast of Pringle.

Ownership.- The Abingdon Sanitary Manufacturing Co.

Geology.- A pegmatite dike in schist strikes north. The length exposed s about 500 feet and the width 42 feet. The pegmatite is overlain by sedi- ents. The dike contains a dark-blue and pink feldspar of excellent quality, ery little quartz or mica, and no tourmaline.

Operation.- A 5-by 7-foot shaft was sunk 30 feet in feldspar. A few :all exploratory cuts were made.

'irginia Lode

No. 99 on figure 2. Date of inspection: October 10, 1938.

Situation.- About 1 1/2 miles northeast of Pringle; 1 1/2 miles directly :orth of the Townsite lode.

Ownership.- The Abingdon Sanitary Manufacturing Co.

Geology.- A pegmatite dike in schist contains feldspar, quartz, mica, :d tourmaline, blocky but mixed. The dike is exposed as a cliff about 200 :eet high; the length of the outcrop is about 500 feet and the width at its :enter about 250 feet.

Operation.- Three or four small exploratory cuts have been made.

Consolidated Feldspar Corporation Prospects

The Consolidated Feldspar Corporation owns 67 lode locations and 5 :atented lode claims in the Custer district, thus covering 72 dikes in the :rea. Their field supervisor employs a miner and a truck driver the year :round at $4.50 per day each for the purpose of keeping up the assessment work. 'ost of the locations have been acquired during the last 3 years and are held :s prospects. They are described in the following pages. Figure 1 shows their :pproximate situations.

:orothy Lode

No. 1 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 2 miles southwest of Custer.

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Geology.- A pegmatite dike in schist contains blocky feldspar of good quality. Very little tourmaline is present.

Operation.- A cut 15 to 20 feet wide was driven 25 feet; the face was 18 feet high. From 25 to 30 percent of the rock broken was sorted out as feldspar. About 250 tons of spar was shipped to the mill at Keystone. The property was idle in September 1938.

Dorothy No. 1 Lode

No. 2 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 2 miles southwest of Custer; it is bounded by the Dorothy lode location on the west and by the Endicott ranch on the north.

Geology.- A pegmatite "blow-up" in schist contains feldspar, quartz, mic and considerable tourmaline. The outline of the pegmatite body is not definitely marked on the surface. The spar is intergrown with quartz.

Operation.- A cut 8 feet wide was driven 20 feet; the face is about 8 feet high. No shipments have been made. The property was idle in September 1938.

Helen Lode

No. 4 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 4 miles south of Custer.

Geology.- A pegmatite segregation in granite and schist contains feldspa of good quality, quartz, mica, and tourmaline.

Operation.- A narrow cut was driven about 35 feet long; the face is abou 10 feet wide and 10 feet high.

Helen No. 1 Lode

No. 72 on figure 1. Date of inspection: October 4, 1938.

Situation.- About 4 miles south of Custer.

Geology.- A pegmatite dike in schist strikes north and dips 80° W. It contains a mixture of feldspar, quartz, mica, and a little tourmaline.

Operation.- A cut 5 feet wide was driven 8 feet; the face was 10 feet high. The cut exposed stringers of schist in the pegmatite.

Helen No. 2 Lode

No. 3 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 4 miles south of Custer.

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Geology.- A pegmatite dike contains feldspar, quartz, mica, and tourmaline. The spar is intergrown with quartz.

Operation.- A cut 15 feet wide was driven 20 feet; the walls and face are 8 feet high. No shipments have been made. The property was idle when visited.

Helen No. 3 Lode

No. 5 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 4 miles south of Custer.

Geology.- A pegmatite dike occurs in schist.

Operation.- A wall of the dike has been blasted, exposing a face 20 feet wide and 10 feet high. Feldspar and mica are inter-mixed in the face.

Helen No. 4 Lode

No. 6 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 4 miles south of Custer.

Geology.- A pegmatite segregation occurs in granite. The feldspar is intergrown with quartz; mica and tourmaline are also present.

Operation.- An exploratory cut has been driven 100 feet into the pegmatite. No shipments have been made.

Helen No. 5 Lode

No. 7 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 4 miles south of Custer.

Geology.- A pegmatite segregation in granite contains feldspar, quartz, mica, and tourmaline. The spar is intergrown with quartz.

Operation.- A shaft 8 by 15 feet in section has been sunk 6 feet, but no shipments have been made.

Rocky Spar Lode

No. 8 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 2 miles south of Custer.

Geology.- A pegmatite dike in schist contains feldspar, stringers of quartz, mica, and tourmaline.

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Operation.- A main cut 10 feet wide has been driven 20 feet; the face was 10 feet high. The spar on the right wall of the cut was of good quality; that on the left wall contained considerable tourmaline. Three smaller cuts showed spar mixed with quartz, mica, and tourmaline. No shipments have been made.

Bald No. 1 Lode

No. 9 on figure 1. Date of inspection: September 22, 1938.

Situation.- 3 miles east of Pringle.

Geology.- A pegmatite dike in granite and quartzite contains feldspar, quartz, mica, and tourmaline. The spar is intergrown with quartz.

Operation.- Exploration work has been done at four places on the dike walls; the feldspar appears mixed with the other pegmatite minerals.

Bald No. 2 Lode

No. 10 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 3 miles east of Pringle.

Geology.- A pegmatite dike in granite, quartzite, and schist contains feldspar of good quality, quartz, mica, and a little tourmaline.

Operation.- A shaft 10 by 12 feet in section has been sunk 6 feet.

Bald No. 3 Lode

No. 11 on figure 1. Date of inspection: September 22, 1938.

Situation.- 3 miles east of Pringle.

Geology.- A pegmatite dike in granite, quartzite, and schist contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A shaft 8 by 10 feet in section was 4 feet deep; a cut 6 feet wide had been driven 5 feet; the face was 8 feet high.

Bald No. 4 Lode

No. 12 on figure 1. Date of inspection: September 22, 1938.

Situation.- About 4-1/2 miles east of Pringle.

Geology.- A pegmatite dike in granite contains feldspar, quartz, pockets of mica, and a little tourmaline.

Operation.- A cut 8 feet wide has been driven 20 feet; the face was 8 feet high.

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Lge Lode

No. 13 on figure 1. Date of inspection: September 23, 1938.

Situation.- SE1/4 sec. 28, T. 3 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with artz and tourmaline.

Operation.- A cut 8 feet wide has been driven 15 feet; the face was 6 eet high.

on Lode

No. 14 on figure 1. Date of inspection: September 23, 1938.

Situation.- SW1/4 sec. 4, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains a pink feldspar intermixed ith quartz, mica, and tourmaline.

Operation.- A cut 8 feet wide has been driven 12 feet; the face was 8 eet high.

incoln Lode

No. 17 on figure 1. Date of inspection: September 23, 1938.

Situation.- About 5 miles southwest of Custer.

Geology.- A pegmatite dike in schist contains pink feldspar, quartz, considerable mica, and tourmaline. Some of the spar is clear and some contains orduroy quartz.

Operation.- A cut 10 feet wide has been driven 30 feet; the face was 20 eet high. No shipments have been made.

incoln No. 1 Lode

No. 62 on figure 1. Date of inspection: October 4, 1938.

Situation.- About 1 mile west of Mayo station.

Geology.- A pegmatite dike in schist strikes northerly and dips 80° W. It contains both red and blue feldspar of good quality mixed with quartz, stringers of mica, and very little tourmaline.

Operation.- A cut 12 feet long and 10 to 20 feet wide was driven through he dike.

incoln No. 2 Lode

No. 63 on figure 1. Date of inspection: September 29, 1938.

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Situation.- About 2-1/2 miles southwest of Sylvan Lake.

Geology.- A pegmatite dike in schist contains feldspar, some of good quality, quartz, mica, and a little tourmaline.

Operation.- A wall of the outcrop was slabbed 2 feet, which resulted in a face 20 feet wide and 9 feet high. This opening serves both Lincoln No. 2 and Lincoln No. 3 lodes.

Lincoln No. 3 Lode

No. 64 on figure 1. Date of inspection: September 29, 1938.

Situation.- About 3 miles west of Sylvan Lake.

Operation.- A common opening serves both Lincoln No. 2 and Lincoln No. 3 lodes.

Lincoln No. 4 Lode

No. 65 on figure 1. Date of inspection: September 29, 1938.

Situation.- About 3 miles southwest of Sylvan Lake.

Geology.- A pegmatite dike in schist contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A cut 10 feet wide has been driven 7 feet; the face was 8 feet high.

Lincoln No. 5 Lode

No. 66 on figure 1. Date of inspection: October 4, 1938.

Situation.- About 1 1/2 miles west of Mayo station.

Geology.- A pegmatite dike in schist contains pink feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A cut 8 feet wide has been driven 8 feet; the face was 8 fee high.

Lincoln No. 6 Lode

No. 74 on figure 1. Date of inspection: October 4, 1938.

Situation.- In N1/2 sec. 27, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with quartz, stringers of good mica, and tourmaline.

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Operation.- A cut 8 feet wide was driven 20 feet; the face was 6 feet
h. Schist was exposed for 10 feet on one wall, near the middle of the cut,
in the face of the cut. A little beryl had been taken out.

coln No. 7 Lode

No. 18 on figure 1. Date of inspection: September 23, 1938.

Situation.- Sec. 5, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar, quartz, mica, and
rmaline.

Operation.- A cut 6 feet wide has been driven 15 feet. The face, which
6 feet high, exposes schist, but this is probably an inclusion in the dike.

ite Mica Lode

No. 20 on figure 1. Date of inspection: September 23, 1938.

Situation.- Sec. 7, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike about 20 feet wide in schist strikes north-
st and dips 30° SW. It contains feldspar, quartz, mica, and tourmaline.
e hanging-wall schist is about 3 feet thick; beyond it is more pegmatite.

Operation.- A main cut was driven 40 feet to crosscut the schist. The
ace, 12 feet wide and 12 feet high, is in pegmatite. From a point 8 feet be-
nd the face of the cut a shaft 8 by 12 feet in section was sunk 6 feet. The
ottom of the shaft is at about the same elevation as the top of the cut.

Another cut, about 75 feet north of the main cut, was 15 feet long; it
as 5 feet wide and 10 feet high.

hite Mica No. 1 Lode

No. 19 on figure 1. Date of inspection: September 23, 1938.

Situation.- Adjoins White Mica lode location on the east.

Geology.- A pegmatite dike in schist contains feldspar intermixed with
uartz, mica, and tourmaline.

Operation.- A cut 10 feet wide has been driven 25 feet in the footwall of
he dike; the face is about 4 feet high. No shipments have been made.

outh Lode

No. 21 on figure 1. Date of inspection: September 23, 1938.

Situation.- Sec. 5, T. 4 S., R. 5 E., B. H. M.

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Geology.- A pegmatite dike in schist, striking north, contains feldspar, quartz, mica, and tourmaline.

Operation.- A cut 8 feet wide has been driven 18 feet; the face is about 2-1/2 feet high.

East Lode

No. 22 on figure 1. Date of inspection: September 23, 1938.

Situation.- Sec. 5, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A central cut 6 feet wide was driven 15 feet; the face was 8 feet high. Similar cuts were made at points about 25 feet north, 500 feet north, and 25 feet south of the central cut.

High Lode

No. 23 on figure 1. Date of inspection: September 23, 1938.

Situation.- Sec. 5, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist strikes north; it contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- Two cuts have been driven toward each other from opposite sides of the dike. One cut is 8 feet wide and 20 feet long with a face 6 feet high. The other cut is 7 feet wide and 15 feet long with a face 8 feet high. The faces of the two cuts are about 25 feet apart.

Top Lode

No. 24 on figure 1. Date of inspection: September 23, 1938.

Situation.- Sec. 5, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A cut 8 feet wide has been driven 12 feet; the face is 10 feet high.

West Lode

No. 25 on figure 1. Date of inspection: September 23, 1938.

Situation.- Sec. 5, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains mixed feldspar, quartz, mica, and tourmaline.

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Operation.- Two cuts, each 15 feet long and 6 feet wide, have been driven ward each other from opposite sides of the dike; the faces are about 30 feet art. One cut, with a face 7 feet high, is in pegmatite. The other cut, with face 12 feet high, is in schist.

re Top No. 1 Lode

No. 26 on figure 1. Date of inspection: September 24, 1938.

Situation.- Sec. 32, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in quartzite contains badly mixed feldspar, artz, mica, and tourmaline.

Operation.- A cut 10 feet wide has been driven 10 feet; the face is 12 eet high.

are Top No. 2 Lode

No. 27 on figure 1. Date of inspection: September 24, 1938.

Situation.- Sec. 32, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in quartzite contains feldspar intermixed with uartz, mica, and tourmaline.

Operation.- A cut 10 feet wide has been driven 15 feet; the face was 10 feet high.

Star Lode

No. 28 on figure 1. Date of inspection: September 24, 1938.

Situation.- Sec. 5, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist and quartzite contains intermixed feldspar, quartz, mica, and tourmaline.

Operation.- A cut 8 feet wide was driven 15 feet; the face was 10 feet high. Another cut, 400 feet to the west, was 10 feet long and 8 feet wide; the face was 6 feet high. A third and smaller cut was also made.

Sno Lode

No. 29 on figure 1. Date of inspection: September 24, 1938.

Situation.- Sec. 32, T. 3 S., and sec. 5, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist and quartzite contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A shaft 8 by 8 feet in section was sunk 4 feet. About 400 feet from the shaft a cut 10 feet wide was driven 6 feet; the face is 8 to 10

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feet high. The upper half of the face is in schist that dips at 45°. Another cut 6 feet wide has been driven 15 feet; the face is 10 feet high.

Sno No. 1 Lode

No. 30 on figure 1. Date of inspection: September 24, 1938.

Situation.- Sec. 32, T. 3 S.; and sec. 5, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A main cut 8 feet wide was driven 12 feet; the face was 5 fe high. Two small cuts were made near by, one in spar and the other in quartz. About 300 feet northwest of the main cut another cut 5 feet wide was driven 10 feet; the face was 10 feet high. The spar in the last cut was unusually white.

Sno No. 2 Lode

No. 31 on figure 1. Date of inspection: September 24, 1938.

Situation.- Sec. 32, T. 3 S.; and sec. 5, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in quartzite contains feldspar intermixed wit quartz, mica, and tourmaline.

Operation.- A cut 10 feet wide was driven 10 feet; the face was 5 feet high. About 100 feet northwest of that cut, another cut 6 feet wide was driven 10 feet; the face was 10 feet high. The second cut showed cleaner spa An old cut about 50 feet west of the second cut probably was driven for mica.

Bull Moose Lode

No. 32 on figure 1. Date of inspection: September 24, 1938.

Situation.- Sec. 32, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in granite and quartzite contains feldspar, quartz, mica, and tourmaline. The minerals, although mixed, are somewhat blocky.

Operation.- A cut 10 feet wide has been driven 25 feet; the face was 10 feet high.

Mitchell Lode

No. 39 on figure 1. Date of inspection: September 27, 1938.

Situation.- Sec. 9, T. 4 S., R. 5 E., B. H. M.

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Geology.- A pegmatite dike in quartzite and schist contains feldspar, rtz, mica, and a little tourmaline.

Operation.- A cut 8 feet wide has been driven 18 feet; the face was 10 t high.

chell No. 1 Lode

No. 33 on figure 1. Date of inspection: September 24, 1938.

Situation.- Adjoins Stanhope place on the west.

Geology.- A pegmatite dike in schist contains feldspar intermixed with rtz, mica, and tourmaline.

Operation.- A cut 6 feet wide was driven 6 feet; the face was 10 feet high.

chell No. 2 Lode

No. 86 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 9, T. 3 S., R. 5 E., B. H. M.; adjoins the O. K. lode the east and the New Deal lode on the north.

Geology.- A pegmatite dike in granite contains iron-stained feldspar in- rmixed with quartz, mica, and tourmaline.

Operation.- A cut 5 feet wide was driven 12 feet; the face was 4 feet high.

rry Lode

No. 40 on figure 1. Date of inspection: September 27, 1938.

Situation.- In S1/2 sec. 9, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in quartzite contains feldspar intermixed with artz, mica, and tourmaline.

Operation.- A cut 8 feet wide has been driven 8 feet; the face was 10 et high.

ves Lode

No. 41 on figure 1. Date of inspection: September 27, 1938.

Situation.- In NE1/4 sec. 15, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in granite and schist contains feldspar, quartz, ca, and tourmaline. The spar is of good quality, free from quartz and tour- line. The tourmaline is associated with the mica, which occurs in relatively rge sheets in seams.

60

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Operation.- A cut 8 feet wide has been driven 20 feet; the face was 8 fe high. During July and August 1938 25 tons of spar was shipped to Keystone. About 100 pounds of mica have been hand-sorted.

Red Deer Lode

No. 43 on figure 1. Date of inspection: September 27, 1938.

Situation.- In secs. 15 and 22, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains mixed feldspar, quartz, tourmaline, and an unusually large amount of mica.

Operation.- Two parallel cuts 8 feet wide and 6 feet high in the face ha been driven 18 feet. About one-half ton of mica was shipped during 1938. Th property was idle in September 1938.

I. X. L. Lode

No. 45 on figure 1. Date of inspection: September 27, 1938.

Situation.- In sec. 21, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains a mixture of feldspar, quartz, mica, and tourmaline.

Operation.- A discovery shaft 8 by 16 feet in section was sunk 6 feet. About 200 feet east of it another shaft, 8 by 10 feet in section, was sunk 6 feet. A cut 6 feet wide was driven 10 feet toward the second shaft; the face at 6 feet from the shaft was 8 feet high. About 75 feet east of the second shaft an old cut 6 feet wide had been driven 40 feet; the face was 6 feet hig Some mica had been sorted out in former years. The property was idle in September 1938.

I. X. L. No. 3 Lode

No. 84 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 9, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in granite and schist contains feldspar, inte mixed with quartz and mica; tourmaline is absent.

Operation.- A cut 8 feet wide was driven 15 feet; the face was 7 feet hig

I. X. L. No. 4 Lode

No. 44 on figure 1. Date of inspection: September 27, 1938.

Situation.- In sec. 21, T. 3 S., R. 5 E., B. H. M.

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Geology.- A pegmatite dike in schist contains a mixture of feldspar, rtz, and mica. Very little tourmaline is found, but there are small quan- ies of garnet.

Operation.- A cut 8 feet wide was driven 5 feet; the face was 10 feet high. ther cut, 150 feet east of the first cut, was 15 feet long, 6 feet wide, and eet high at the face.

X. L. Fraction

No. 46 on figure 1. Date of inspection: September 27, 1938.

Situation.- In sec. 21, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with rtz, mica, and tourmaline.

Operation.- A cut 10 feet wide has been driven 12 feet; the face was 6 et high.

d Lode

No. 47 on figure 1. Date of inspection: September 27, 1938.

Situation.- In T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar, quartz, mica, and rmaline. The minerals are blocky but mixed.

Operation.- A cut 10 feet wide was driven 10 feet; the face was 10 feet gh.

st Spring Lode

No. 48 on figure 1. Date of inspection: September 27, 1938.

Situation.- In SW1/4 sec. 22, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in quartzite and schist contains a mixture of eldspar, quartz, mica, and tourmaline.

Operation.- A cut 8 feet wide was driven 7 feet; the face was 8 feet high.

d Lode

No. 49 on figure 1. Date of inspection: September 27, 1938.

Situation.- In secs. 4 and 9, T. 5 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist and quartzite contains a mixture of eldspar, quartz, mica, and tourmaline.

560

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Operation.- A cut 12 feet wide was driven 10 feet; the face was 8 feet h

Roxy Lode

No. 50 on figure 1. Date of inspection: September 27, 1938.

Situation.- In SE1/4 sec. 18, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in quartzite and schist contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A cut 6 feet wide was driven 8 feet; the face was 9 feet hig

Flynn Lode

No. 52 on figure 1. Date of inspection: October 4, 1938.

Situation.- In N1/2 sec. 27, T. 4 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A cut driven 15 feet was 7 feet wide and 8 feet high at the face. The bottom 18 inches of the face was in schist. Another cut, about 25 feet west of the first cut, was 10 feet long and 5 feet wide; the face was 6 feet high.

Sunset Lode

No. 53 on figure 1. Date of inspection: September 29, 1938.

Situation.- About 5-1/2 miles northwest of Custer.

Geology.- A pegmatite dike in schist contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A cut 8 feet wide was driven 15 feet; the face was 5 feet hig

Sunrise Lode

No. 54 on figure 1. Date of inspection: September 29, 1938.

Situation.- About 5 miles northwest of Custer.

Geology.- A pegmatite dike occurs in schist. Segregation of the feldspar minerals is limited to a 2-foot "dike" exposed on a wall of the cut and a smal showing in the bottom of the cut.

Operation.- A cut 6 feet wide was driven 15 feet; the face was 7 feet hig

Pine Top Lode

No. 55 on figure 1. Date of inspection: October 4, 1938.

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Situation.- In sec. 2, T. 4 S., R. 4 E., B. H. M.

Geology.- The lode is in one of a series of parallel pegmatite dikes that ce northerly and dip 70° W. It contains feldspar somewhat intermixed with tz, mica, and tourmaline.

Operation.- A cut 6 feet wide was driven 10 feet; the face was 7 feet . Another cut, 150 feet to the south, was 10 feet long and 10 feet wide; face was 6 feet high.

Top Fraction Lode

No. 56 on figure 1. Date of inspection: October 4, 1938.

Situation.- In sec. 11, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with rtz, mica, and tourmaline.

Operation.- Four cuts have been made; two are small and irregular, one is eet long and 12 feet wide with a face 8 feet high, and the fourth is 15 feet s and 7 feet wide with a face 5 feet high.

Wood Lode

No. 57 on figure 1. Date of inspection: October 4, 1938.

Situation.- In sec. 1, T. 5 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar that is iron-stained otherwise of good quality. Quartz and mica occur in bunches; tourmaline is ent.

Operation.- A cut 6 feet wide was driven horizontally for 25 feet; then floor was stepped up 4 feet and the cut was widened to 12 feet and driven additional 12 feet; the face was 8 feet high. A loading bin is situated feet from the mouth of the cut. Former shipments of spar amounted to about tons. The property was idle in October 1938.

Bert Lee Lode

No. 58 on figure 1. Date of inspection: October 4, 1938.

Situation.- In sec. 23, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar, quartz, mica, and rmaline; the minerals are all mixed.

Operation.- A cut 6 feet wide was driven 25 feet; the face was 7 feet high. e first half of the cut and the face were in schist.

50

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Pick Lode

No. 59 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 9, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar, quartz, mica, a tourmaline; the minerals are intermixed and iron stained.

Operation.- A cut 10 feet wide was driven 8 feet; the face was 7 feet h Another cut, about 200 feet to the east, was 12 feet long and 6 feet wide; t face was 6 feet high. The second cut was in a coarsely crystalline granite; tourmaline was absent.

E. M. Lode

No. 82 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 8, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar, quartz, and mic the minerals are iron stained. Tourmaline is absent.

Operation.- A cut 6 feet wide was driven 12 feet; the face was 7 feet h

A. M. Lode

No. 83 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 8, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains blocky bluish feldspar, quartz, and mica, all of which are iron stained.

Operation.- A cut 8 feet wide was driven 8 feet; the face was 6 feet hi Another cut in the wall of the dike was 2 feet long and 10 feet wide; the fa was 10 feet high.

Art Lode

No. 61 on figure 1. Date of inspection: October 4, 1938.

Situation.- About 3-1/2 miles northeast of Pringle.

Geology.- A pegmatite dike in schist contains feldspar partially inter- mixed with quartz, a little mica, and tourmaline. The spar is iron stained contains some quartz.

Operation.- A cut 15 feet wide has been driven 5 feet; the face was 8 f high.

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Horn Lode

No. 67 on figure 1. Date of inspection: September 29, 1938.

Situation.- About 1 mile north of Custer.

Geology.- A pegmatite dike in schist contains feldspar, quartz, a dark mica obably biotite), and a little tourmaline.

Operation.- A cut 8 feet wide has been driven 18 feet; the face was 10 t high.

Spar Lode

No. 68 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 23, T. 4 S., R. 3 E., B. H. M; it is bounded on the north the Michaud homestead.

Geology.- A pegmatite dike in schist strikes easterly and dips 60° S. It ntains blocky, deep-pink feldspar, bunches of quartz and mica, and very little rmaline.

Operation.- A cut 15 feet wide was driven 5 feet; the face was 12 feet gh. Another cut, 50 feet to the south, was 5 feet long and 20 feet wide; e face was 8 feet high. The second cut showed more tourmaline but it did not cur in the spar. About 75 tons of spar had been shipped from the property; was idle in October 1938.

ty-five Lode

No. 69 on figure 1. Date of inspection: September 29, 1938.

Situation.- In sec. 13, T. 3 S., R. 3 E., and sec. 18, T. 3 S., R. 4 E., H. M.

Geology.- A pegmatite dike in schist contains feldspar, quartz, mica, and little tourmaline. Garnets are present in a seam.

Operation.- A cut 8 feet wide was driven 10 feet; the face was 10 feet gh.

Lode

No. 70 on figure 1. Date of inspection: September 29, 1938.

Situation.- In sec. 34, T. 2 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with rtz, mica and a little tourmaline.

Operation.- A cut 5 feet wide was driven 10 feet; the face was 8 feet high.

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Poppy Lode

No. 71 on figure 1. Date of inspection: September 29, 1938.

Situation.- In SE1/4 sec. 1, T. 3 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A cut 5 feet wide and 6 feet high was driven 10 feet through the dike. Another cut, about 300 feet to the northeast, was made by breaking off a projection on a wall of the dike. The wall was 40 feet high. About 30 tons of rock was broken, including some spar of good quality.

Lookout Lode

No. 73 on figure 1. Date of inspection: October 4, 1938.

Situation.- In N1/2 sec. 27, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains pink feldspar intermixed with quartz, mica, and tourmaline.

Operation.- A cut 6 feet wide was driven 12 feet; the face was 6 feet hig

Red Poppy Lode

No. 75 on figure 1. Date of inspection: October 4, 1938.

Situation.- In SW1/4 sec. 27, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in granite contains deep-pink feldspar and quartz, mixed, stringers of dark mica, and a little tourmaline.

Operation.- A cut 8 feet wide was driven 10 feet, resulting in a face 10 feet high.

Maxine Lode

No. 76 on figure 1. Date of inspection: October 4, 1938.

Situation.- In secs. 34 and 35, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in granite and schist contains pink feldspar i termixed with quartz, and mica of good grade. There is very little tourmaline

Operation.- A cut 7 feet wide was driven 12 feet; the face was 7 feet hig Another cut, 25 feet to the north, was 15 feet long and 6 feet wide; the face was 9 feet high. In the second cut the minerals were more mixed.

Mack Lode

No. 87 on figure 1. Date of inspection: October 4, 1938.

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Situation.- In sec. 2, T. 5 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar intermixed with ıartz, mica, and tourmaline.

Operation.- A cut 6 feet wide was driven 12 feet; the face was 10 feet ·gh.

ed Bird Lode

No. 77 on figure 1. Date of inspection: October 5, 1938.

Situation.- In secs. 15, 16, and 22, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar, quartz, mica, and ourmaline, mixed.

Operation.- A cut 6 feet wide was driven 12 feet; the face was 10 feet high.

hort Lode

No. 78 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 15, T. 4 S., R. 4 E., B. H. M.

Geology.- A pegmatite dike in schist contains feldspar, some of it of ood quality, quartz, mica, and tourmaline. On one wall of a cut the minerals ccur in blocky segregations; otherwise they are mixed.

Operation.- A cut 5 feet wide was driven 10 feet; the face was 8 feet high. he floor of the cut was in schist..

). K. Lode

No. 80 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 9, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains a mixture of feldspar, quartz, ica, and tourmaline. Considerable schist is mixed with the minerals.

Operation.- A cut 6 feet wide was driven 8 feet; the face was 5 feet high. nother cut, 250 feet southeast of the first cut, was 18 feet long and 6 feet ide and 5 feet high at the face.

). K. No. 2 Lode

No. 81 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 9, T. 3 S., R. 5 E., B. H. M.

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Geology.- A pegmatite dike in schist contains feldspar, quartz, mica, and very little tourmaline. Considerable schist is mixed with the pegmatite minerals, all of which are iron-stained.

Operation.- A cut 7 feet wide was driven 10 feet; the face was 6 feet high. Another cut, 200 feet to the north was 8 feet long and 6 feet wide; the face was 6 feet high.

O. K. No. 4 Lode

No. 79 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 9, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in schist contains bluish feldspar, quartz, mica, and very little tourmaline. The minerals are mixed and iron stained.

Operation.- A cut 6 feet wide was driven 20 feet, resulting in a face 5 feet high.

Bet Lode

No. 85 on figure 1. Date of inspection: October 5, 1938.

Situation.- In sec. 9, T. 3 S., R. 5 E., B. H. M.

Geology.- A pegmatite dike in granite and schist contains feldspar, quartz, mica, and tourmaline; all are mixed and iron stained.

Operation.- A cut 8 feet wide was driven 15 feet; the face was 8 feet high.

CONCLUSIONS

Pegmatite mining in the Black Hills of South Dakota has had an impressive past. Mica, lithium minerals, and feldspar, in turn, have dominated mining operations, and many rare minerals have been produced as byproducts. To obtain marketable products, mining has been selective and has been supplemented by hand sorting. This region urgently needs the application of recently developed processes for economically recovering pegmatite minerals that are too intimately mixed for hand sorting. Current problems are presented by the occurrence in the same "dike" of cassiterite, spodumene, feldspar, and mica, each of which by itself would be marketable, and by the presence of tourmaline, which must be separated from otherwise marketable feldspar.

Impetus has been given to the present exploitation of feldspar "dikes" by the construction and operation of grinding mills at Keystone and Custer. During the last 3 years, thousands of mineral locations have been made for feldspar, and it is possible that many undiscovered deposits may exist in the region. Small feldspar "dikes" are mined by (1) ranchers and farmers during their spare time, (2) hired men on the ranches, who are paid additional wages for mining when their ranch duties permit, (3) miners operating their own "dikes", and

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lessees. Under these conditions, mining costs probably are low. A surıs number of unexploited "dikes" makes for neglect of the dead work that is ɔessary in continuous mining.

As long as manufacturing centers are confined to the East, the feldspar dustry in South Dakota will suffer from high transportation costs in competiɔn with eastern and Canadian feldspar.

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